NEW ZEALAND JOURNAL OF Agriculture

· JULY 1949 ·

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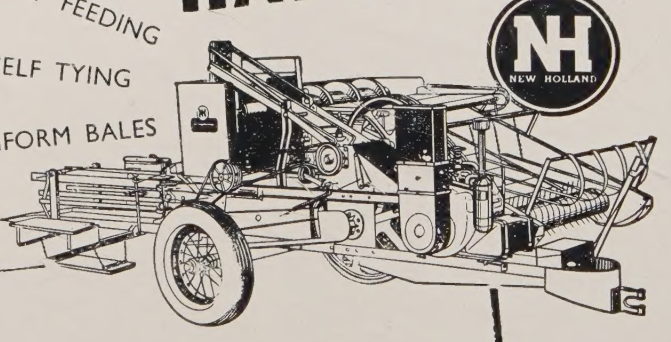

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Hon. E. L. Cullen,
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This month's cover

The stone store at Kerikeri, the oldest stone building in New Zealand, which is the subject of this month's cover, has been reproduced from a colour photograph by Neuline Film Studios Ltd., Auckland. The store was built in 1833 for members of the Church Missionary Society stationed at Kerikeri. Some of the stone was quarried and shaped locally by Maoris and some by James Kemp, a smith and a member of the society, who also supervised the erection of the building. It was used as a store by the missionaries and even today it serves as a post office and store for the district. Mission farming at Kerikeri failed to develop, but today the district produces large quantities of citrus and sub-tropical fruits.

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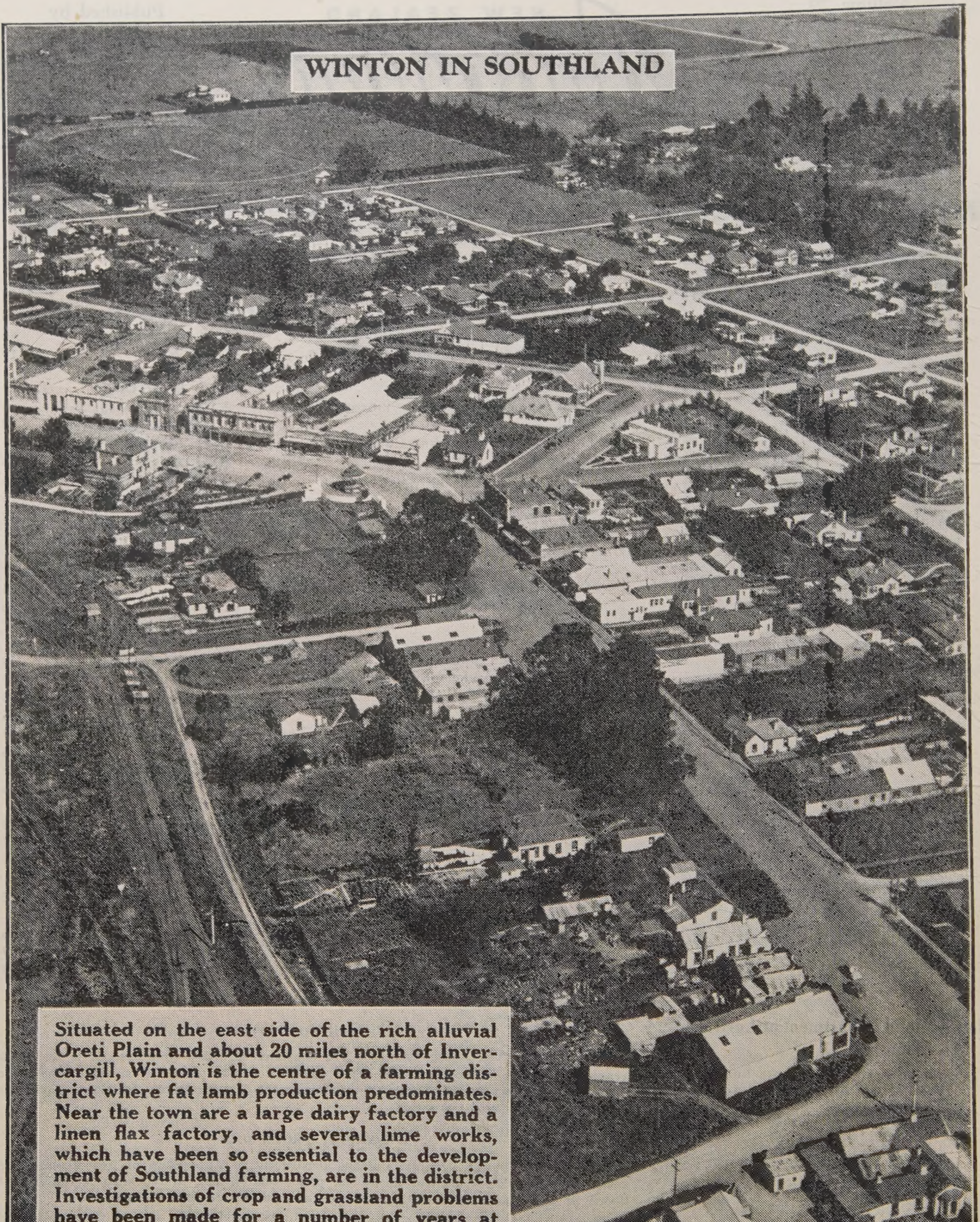
WINTON IN SOUTHLAND



Situated on the east side of the rich alluvial Oreti Plain and about 20 miles north of Invercargill, Winton is the centre of a farming district where fat lamb production predominates. Near the town are a large dairy factory and a linen flax factory, and several lime works, which have been so essential to the development of Southland farming, are in the district. Investigations of crop and grassland problems have been made for a number of years at the experimental farm close to the town.

[*V. C. Browne photo.*

CONTROLS REMOVED FROM SALE OF FERTILISERS

I AM pleased to announce that, following receipt of a recommendation from Federated Farmers of New Zealand, the New Zealand Dairy Board, the New Zealand Dairy Products Marketing Commission, and the New Zealand Meat Producers' Board, the Government has approved the cessation of controls over the sales of mineral and organic fertilisers as from July 1.

In general, the fertiliser situation has improved greatly. Recently the International Emergency Food Committee approved the de-allocation of all types, which indicates that nitrogenous and potassic fertilisers should be available in greater quantities. With the joint purchase of Christmas Island concessions by the Australian and New Zealand Governments and the increased availability of supplies from Makatea and Nauru and Ocean Islands, the British Phosphate Commission has indicated that it can supply any reasonable quantity of raw rock phosphate in the next 12 months. It has been arranged that a total of 450,000 tons of raw phosphate rock will be imported during the year July 1, 1949, to June 30, 1950. This represents approximately 75,000 tons more than has been used in manufacture during the current year. In addition, it is expected that larger tonnages of basic slag will be available from Belgium and greater quantities of finely-ground rock phosphate from North Africa.

Maintenance of Proper Distribution

Though the external supply is satisfactory, it will be necessary to maintain proper distribution of the manufactured product. Thus, it is essential that merchant distributors ensure a reasonable supply of fertilisers is available to each of their clients; in particular the interests of farmers in remote areas must be safeguarded. Should distribution under these conditions prove unsatisfactory, the decision now reached to abolish fertiliser rationing will need to be reconsidered.

I thank all who have contributed toward the successful operation of fertiliser rationing during the difficult years through which we have passed. In December, 1940, five phosphate vessels were sunk and the plant on Nauru Island was raided by the Germans. The following year both Nauru and Ocean Islands were bombed by the Japanese, and from December, 1941, to August, 1946, no supplies of raw rock phosphate were available from these sources. Enemy raiders were operating in all seas, and supplies of imported basic slag and finely-ground North African phosphate ceased early in the Second World War.

The raiding of Nauru and Ocean Islands and their subsequent occupation by the Japanese were a heavy blow to primary production in New Zealand, because at that time the whole of the Dominion's supply of raw rock phosphate was obtained from these mandated islands. Thus, early in 1941 it was apparent that New Zealand would have to curtail her fertiliser programme and as from July 1, 1941, a system of fertiliser rationing was introduced.

To assess yearly topdressing allocations the annual average used by each farmer during the period June 1, 1939, to May 31, 1941, was taken as the base. On this basis the annual topdressing fertiliser allocation for 1941-42 was 40 per cent. By the following fertiliser year the supply position had so deteriorated that a further cut was necessary, and for both 1942-43 and 1943-44 the topdressing fertiliser allocation was only 28 per cent. of the annual average of the two base years. For 1944-45 the topdressing allocation remained at 28 per cent., but so that an impetus might be given to dairy production a further 1cwt. was allowed for each milking cow depastured during the season. As the supply position improved the topdressing fertiliser allocation was increased and for 1945-46 it rose to 42 per cent. A further increase to 50.4 per cent. was made for the 1946-47 fertiliser year, and for both 1947-48 and 1948-49 the allocation permitted was 67.2 per cent. Fertiliser for purposes other than topdressing was rationed proportionately.

I consider the quantity available has been used to the best advantage. This could not have been possible without the full co-operation of all sections of the trade and the efforts of farmers and producers themselves.

Excellent Work of Fertiliser Committees

Special tribute must be paid to all who acted on fertiliser committees for the excellent work they did during the time of fertiliser shortages. In addition to an officer of my Department, who acted as chairman, there were on all fertiliser committees two members, one representing the merchants and the other representing the farmers. Members gave their time freely, adjudicating on appeal cases and recommending allocations of fertilisers. Their task was onerous, as they had to forget what would be the normal requirements for economic farming practice and restrict their recommendations to the supply available. Nevertheless, it says much for the fairness and integrity of members of fertiliser committees that, despite the many hundreds of appeal cases considered, there were few cases where farmers disputed the allocations made.

Transport difficulties will persist for some time, and storage capacity at the works for the manufactured product is limited. Therefore, to ensure maximum outputs, deliveries from works must be spread throughout the year. Farmers must play their part; otherwise delays in delivery will be unavoidable.

EDWARD CULLEN, Minister of Agriculture.

CARE OF LIVESTOCK DURING AUGUST

Contributed by the Animal Research Division.

CARE OF CALVING COW

COWS about to calve should be brought into a handy paddock so that they can be kept under supervision. If a cow has difficulty in calving, veterinary assistance should be sought. This should be done as soon as it is obvious that the presentation is not normal and in any case within 6 hours of the beginning of labour. Unskilled interference exhausts the cow and makes the veterinarian's task more difficult or even impossible. Veterinary assistance should also be sought if the cows do not clean within 48 hours. Do not hang weights on the afterbirth.

* * *

STERILITY IN COWS

If difficulty was experienced in getting cows in calf last summer, now is the time to seek veterinary advice with a view to preventing similar trouble this year. An article on trichomoniasis appeared in the September, 1948, issue of the "Journal." Control of this disease depends on using only clean bulls and not mating cows for several months after calving. It is, therefore, too late to do anything if action is deferred until the mating season begins.

* * *

CALF REARING

Calves should either be allowed to suckle or should be fed the milk from their own mothers for the first 3 days. This is most important, as the colostrum or "beastings" contains substances which render the calf much more resistant to scours. Calf sheds should be cleaned daily and milk tins washed and scalded after each feed. If scours occur, a supply of a sulpha drug should be obtained from a veterinarian immediately, as the drug is very effective when used promptly. A scouring calf should receive only water, and the incidence of scours can be reduced somewhat by diluting the milk ration with a quarter of its volume of water. Calves should not be kept in a calf paddock, but, as soon as they are able to walk, should rotate through the paddocks ahead of the cows.

* * *

SELECTION OF CALVES FOR REPLACEMENTS

The full sisters of high-producing heifers and the daughters of merit sires with a high progeny test should always be kept. Providing they are sturdy, the calves of very old cows with good life-time performance should always be kept, and there is no reason why calves of well-bred heifers should not be kept. Twin heifers are seldom worth keeping and the twin of a bull calf should never be kept.

FEEDING AFTER CALVING

Autumn-saved pasture is the best food for newly-calved cows, but it must be grazed in small breaks which the cows will clean up in about 2 hours. They should continue to receive as much silage as they will eat and if the pasture is short and sappy, they should also receive hay.

* * *

MASTITIS

Milk from each quarter should be examined with a strip cup before milking. If it shows any abnormality or if the udder appears inflamed, treatment with penicillin should be begun at once. Three tubes should always be injected, one every 24 hours, even if the milk appears normal after the injection of the first tube. Prompt treatment early in lactation will often save a quarter which otherwise might become weak or even blind.

* * *

LICE ON CALVES

Calves and yearlings may become very lousy during late winter and early spring. Control can be effected by the use of suitable dips, sprays, or washes. Those containing D.D.T. or "Gammexane" are most effective. Repeated treatments may be necessary, as the eggs are difficult to destroy.

* * *

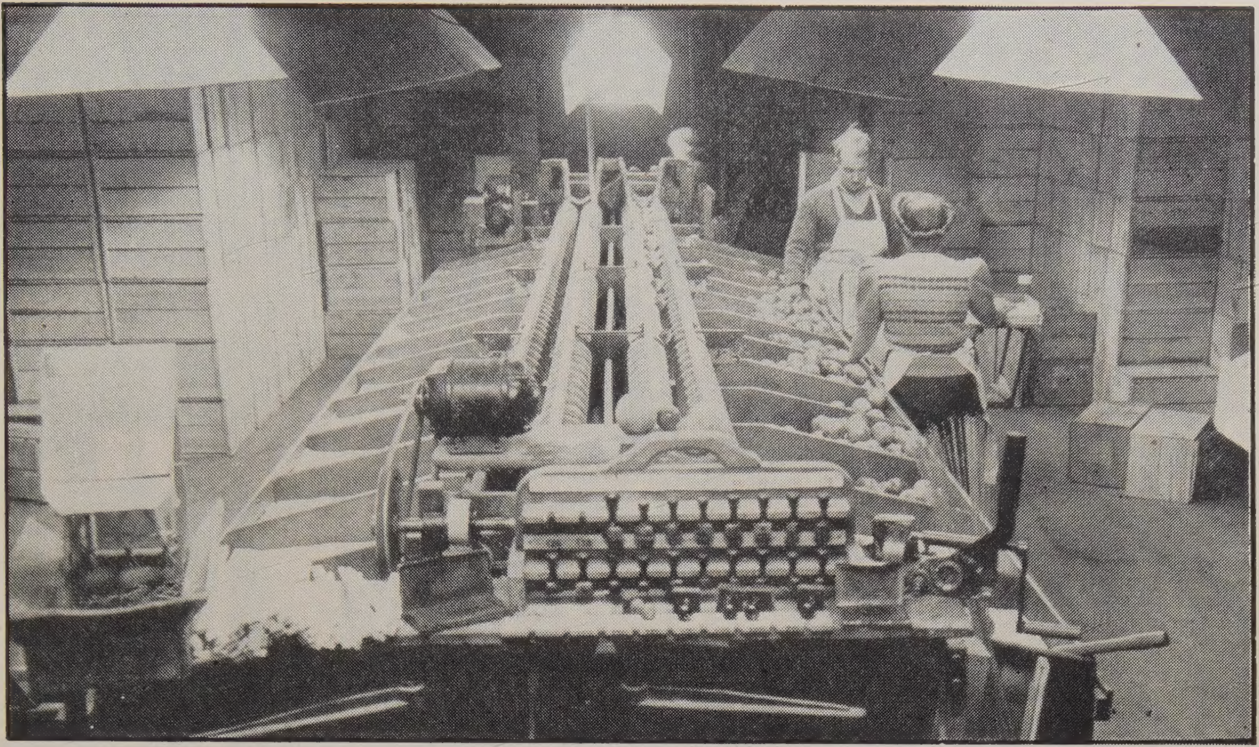
CARE OF LAMBING EWES

About 10 per cent. of all lambs are either born dead or die during the first week. These losses can be reduced by careful shepherding. Many lambs and some ewes can be saved by skilled assistance during lambing. Always use a reliable lubricating antiseptic on hands and wrists. Faulty presentations must be corrected. A lamb should never be pulled away forcibly when a leg or a head is turned back. A number of lambs die from suffocation through the cleanings remaining over their nostrils. These are very easily removed. Where necessary lambs should be assisted to get a drink, particularly where ewes have very large teats. Drawing away a few squirts from these will reduce their size and enable the new-born lambs to suckle. Ewes with very large teats, very small teats, badly-placed teats, or defective udders should be marked for culling, as a big percentage of their lambs will die. Many lambs which die during cold or wet weather would survive if they got a good drink soon after birth.

* * *

DISEASES OF CHICKS

Navel disease is contracted in the incubator, which should be cleaned scrupulously and fumigated with formalin between batches of chicks. Pullorum disease can be controlled only by repeated blood testing of all stock, immediate disposal of all reactors, and thorough cleaning and disinfection of premises after each test.



HEADING PHOTOGRAPH: **Interior of a packing shed equipped with shaded fluorescent lighting. (The photograph was taken at night with a time exposure and no additional lighting was necessary.)** *News-photo Service photo.*

Layout and Organisation of Packing Shed

By L. B. DICKER, Fruit Inspector,
Department of Agriculture, Hastings.

THE success of an orchardist does not end with the production of a large crop of high-grade fruit of preferred size. He has still to harvest and deliver that fruit to the assembly point in the best and most attractive condition, graded to defined standards, and packed so that it will stand up to handling and transport to distant markets. To do this speedily and economically the orchardist must have certain facilities and must be able to make the best use of them. Because of shortage of materials and equipment due to the war, many orchardists, even old-established growers, have had largely to carry on with old and sometimes inefficient equipment. Both old and newly-established growers are at present planning new packing sheds and equipment or extensions to existing facilities and many doubts will arise about size, type, and arrangement. This article deals with a number of points which should assist the grower to make a decision.

THE range and size of the equipment, the space required for the essential supplies of packing materials to handle the crop, and the area needed to accommodate ample stocks of freshly-harvested fruit will necessarily determine the size of the shed. Consideration must also be given to the potential increase in the crop, especially in the case of a young orchard, and in this connection the production of neighbouring mature orchards should be a guide. With the improved methods of culture now being employed the production of even old-established orchards will increase and provision should be made accordingly.

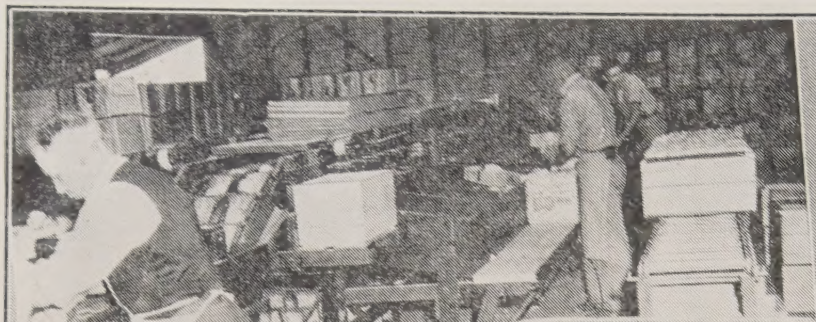
It is important to construct or reconstruct a shed with the central space clear of roof supports and of sufficient length and width to accommodate the fruit size grader, conveyers, lidding press, etc., and to leave ample space at both ends for stacks of cased fruit. At the receiving end sufficient space should be provided to stack several days' consumption of loose-packed fruit, as this will enable the shed to operate over a wet day or two when picking is halted. At the delivery end of the shed sufficient space is required to stack 2 to 3 days' output in grade and size groups, which allows for an accumulation resulting from packing over the weekend or from any delay in transport.

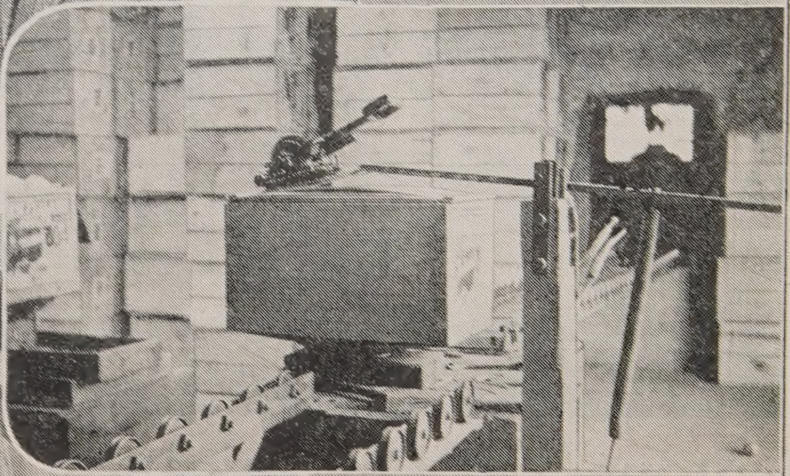
Some growers prefer to have space for all their cases, strawboards, paper, etc., under the same roof, but this entails considerable extra expense, especially if the shed has a raised floor.

Any building with sufficient roof and flooring to keep containers dry and clean is all that is required for a case shed, but strawboard and paper must be stored properly in a clean, dry, weather-proof place. Raising the shed floor to lorry height has many advantages: The cases can be carried on or off the lorry by hand or a hand truck can be wheeled on or off over a steel plate between shed and lorry; again, a conveyer can be extended on to the lorry. The shed floor is kept much cleaner and drier, and, in the case of a wooden floor, there is better bottom ventilation.

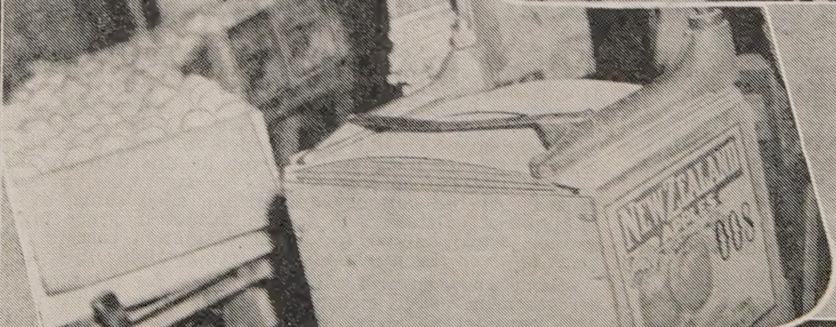
Though large sliding doors may be provided at each end of the shed, it is better to extend both ends of the shed (but not the raised floor) about 10ft. and build two doors on either side of the extensions, thus making two drive-through loading docks the full width of the shed. This design provides good, dry loading and unloading facilities and a larger area in which to work. In windy weather the doors may be closed, which prevents packing paper from blowing about and the raising of dust, and so adds to the comfort of the shed staff. In the off season the extension described supplies good garaging for tractors and implements.

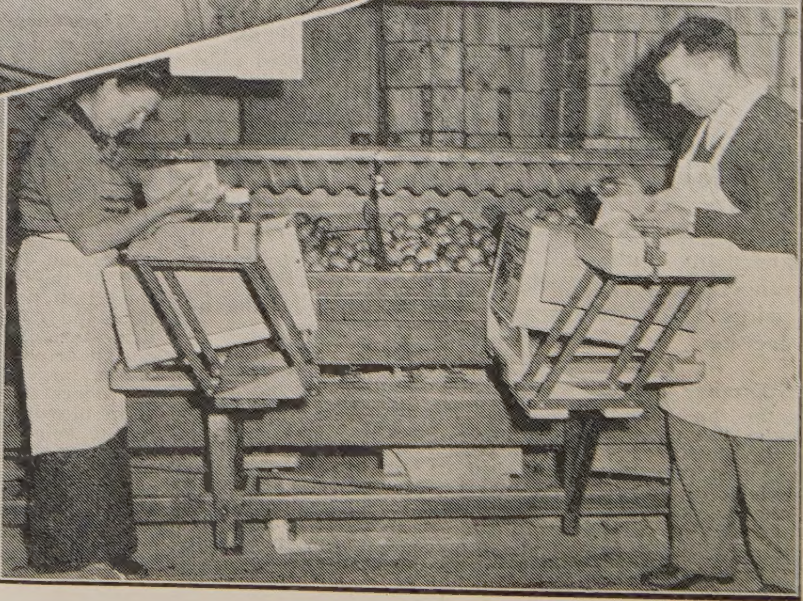
EQUIPMENT FOR THE FRUIT PACKING SHED





Upper left—General view of interior of a packing shed showing the grader, packers, and packed cases on the conveyer. Upper right—Wiring a case of export apples. The illustration shows conveyer, turntable, and spring-loaded support for the wiring machine.

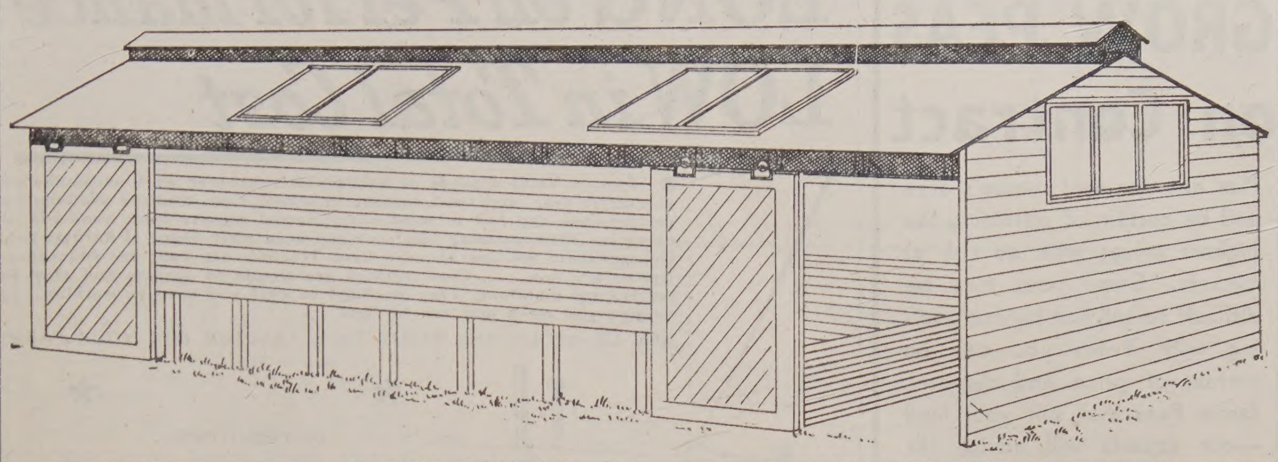




Above—Nailing-up bench and lidding press. On the conveyer at the left of the illustration are cases of fruit ready for lidding. At right—Apple packers at work. Care should be taken to see that the whole set-up height of bins and packing stands allows the packers to work comfortably and efficiently. A slight alteration in the angle or height of cases or paper racks may increase considerably the speed of packing.

[*All photographs except that at upper right by News-photo Service.*

DIAGRAM OF MODEL PACKING SHED



Lighting

Ample roof lighting should be provided over the sorting table, packing bins, and lidding press. Windows in the walls generally become obscured by stacks of cases and if window space is kept clear, it tends to reduce available floor space. Good artificial light, such as that given by fluorescent electric tubes, is needed over the sorting table for dull days and will have to be installed throughout the shed if night work is done.

Thorough ventilation must be provided, as large stacks of freshly-picked fruit give off considerable heat and the more rapidly temperature is reduced the greater is the benefit to the fruit. It is desirable to have ventilators the full length of the ridge and along the tops of the side walls and gratings along the foot of walls. Where there is a raised wooden floor the portion on which the fruit is stacked can be laid with slight spacing between floorboards and side gratings dispensed with. All ventilators should be netted to exclude vermin and birds.

The shed should be constructed in a shaded but airy place; if that is impracticable, construction materials should be low conductors of heat—brick, concrete, timber, or cement-fibre sheets.

The conditions and layout considered suitable for an average orchard with an output of from 5000 to 8000 cases are shown in the diagrams on this and the next pages. The lean-to annexes are optional; the size of them is dependent on the quantity of cases stored or on other requirements of the individual orchardist. The building shown should be on open piles throughout to provide the necessary under-floor ventilation.

Main Equipment

There are several well-known types and sizes of mechanical fruit sizers from which a selection can be made to suit any particular requirement. The choice made will depend on the capacity of the machine to clear the crop in the time available from first picking to closing dates for the varieties included. For example, a much bigger machine would be needed to handle a crop of one variety having, perhaps, only a 2- to 3-week harvesting period than would be required for a similar-sized crop consisting of a range of early, mid-season, and late varieties harvested over, perhaps, 12 to 14 weeks. Generally there are, broadly, 3 sizes of machine available to growers—a type suitable for the small, the average, or the large orchard. A very large orchard or a co-operative packing shed might require several machines.

Roller conveyers—now regarded as standard equipment—should be arranged on either side of the grader to convey packed cases from the packers to a lidding press, which is usually situated at the end opposite to the feed hopper.

[*News-photo Service photo.*

Using a wiring machine.

Organisation

Apples and pears are again being exported and it is essential that the output from the shed of export lines should be speeded up so that fruit may be delivered in the best condition possible for pre-cooling and shipment overseas. The stricter grading, full wrapping of fruit, additional labelling, and the wiring of both ends of the case to comply with the standards required for export entail extra time and labour, which must be offset by good organisation. The rate of picking can always be increased by employing extra pickers, but the economic output of the packing shed depends on the quality and extent of the equipment and the ability of the staff. To ensure the maximum output every time-saver must be adopted, while at the same time all precautions must be taken to protect the fruit. The grower should order early sufficient supplies for the season or, preferably, more than he requires. It is better to have a small carry-over of stock than to be unable to obtain essential supplies at the last minute.

Checking Equipment

Sizing machine: The sizing machine should be checked over very carefully, because it is on the ability of this machine to operate continually and size correctly without damaging the fruit that the whole organisation of the shed depends. The machine must be maintained in perfect condition. An undetected nail or screw in the feed hopper, on the sorting table, or in the bins may continue to damage sufficient fruit to cause a large loss through the rejection of a whole line. The course of the fruit from the hopper to the packer should be clean and smooth and maintained in that condition throughout the season.

Packing stands: Sufficient packing stands, complete with paper rack and spring paper holder, should be provided for each set of bins and they should be freely movable along the bins. Care should be taken that the whole set-up height of bins and packing stands allows the packer to work comfortably and efficiently, as a slight alteration in the angle or height of case or the paper rack may increase

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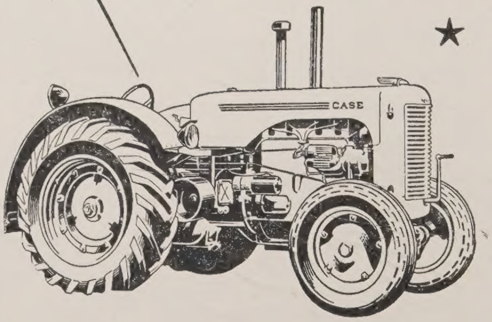

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considerably the speed of packing. Where the shed has a concrete floor a platform, made from 2 10in. boards nailed to ½in. battens spaced 3ft. apart, laid beside the bins for the packers to stand on will reduce fatigue. Similar platforms built to the required height may also be provided for the graders.

Roller conveyers: The roller conveyers should be set up on substantial stands or trestles about 3ft. from bins (to allow passage past the packers) and should have a slight fall to the lidding press.

Lidding presses: Several types of lidding presses are used, but the principle of most is the same. Two steel arms, which bear down on the ends of the lid, are depressed by a foot lever working on a ratchet. These bend the lid over the fruit and at the same time consolidate the pack in the case. There is also a curved depression in the bench which should permit the bottom of the case (where thin bottoms are used) to bulge downward to correspond with the lid. Careful adjustment of the arms to bring down the lid evenly is essential. If the arms are uneven, excessive pressure will be required at the lower end to bring the higher arm down into position and fruit may be injured or cleats and lids damaged. The distance of the arms from the end of the case should never be more than just sufficient to allow the cleat to be nailed on. The ratchet on the foot lever should be checked and maintained in good order or it may slip and result in the operator receiving a badly-bruised leg. A nail stripper, suitable case hatchet, and racks for lids and cleats are needed to complete the lidding equipment.

Cleats: As cleats for the lids are of small dimensions, they dry out very rapidly, and to prevent them from splitting some form of tub or drum, in which they can be soaked for a few hours, should be provided.

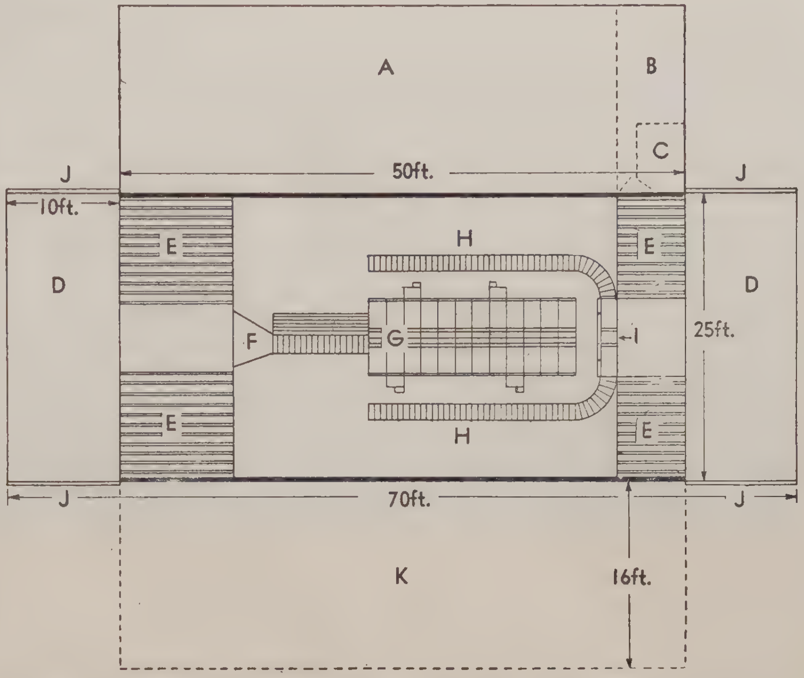
Rubber stamps: A full range of rubber stamps—for reproducing the orchardist's registered number, names of varieties, fruit sizes, and size-group letters—plus pads and ink are needed for branding cases. This equipment should be checked and damaged stamps repaired or replaced.

Labelling: A paste bucket (preferably one that will not rust) and brushes (such as a 4in. paint brush, for the paste, and a 10in. paperhanger's brush, for smoothing down the labels) are needed for labelling.

Wiring: A wiring machine (which is checked by the supplier or his agent) and a wiring bench or turntable, which can be located either on the lidding press (when the nailer-down also does the wiring) or on a separate stand adjacent to the lidding press, will be required. If the short-wire system is used, a convenient wire holder may be made from a 3ft. length of 2in. water pipe set up in a position and at an angle suitable for the easy withdrawal of wires. In the coil-wire system a container is provided for the wire.

Conveyers: If cases of fruit or stacks of empty cases have to be moved some distance about the shed, the work can be speeded up and the time spent on it reduced by providing additional conveyers or clamp trucks.

FLOOR PLAN AND LAYOUT OF SHED



A—Lean-to annex for cases. B—Staff room. C—Office. D—Covered unloading docks or garage space. E—Slotted floor. F—Hopper. G—Sizing machine. H—Conveyers. I—Lidding press. J—Doors. K—Lean-to annex for cases or implements which can be provided if desired.

Cases: Growers should make up as many cases as they can store so that containers may be dried thoroughly. In fact all cases should be made up soon after timber has been received, because if the timber is green, fungus moulds will develop between the boards in the shooks and considerably disfigure the cases, perhaps excluding them from export use. Most orchardists should be capable of constructing a case-making bench, but growers may prefer to purchase one of the automatic case - making machines which are now available. The machines are fast and save a great deal of work.

Paper: Bales of paper should be opened up and packets placed in stacks according to size. Apple cases may be filled with paper and stood on their ends under the conveyers, with the corresponding size of paper opposite the appropriate bins. Care should be taken always to keep the glazed side of the paper upward. Racks of corrugated case liners should be provided handy to the reach of the packers.

Packing guide: A synopsis of grading standards, a packing chart, and a sticker and size-group chart should be displayed in the most convenient places to suit the respective workers.

Office or desk: A small office or a desk for business papers and storage of labels, stickers, first-aid kit, etc., should complete the equipment.

The orchardist should endeavour to have as much preparatory work as possible done before the packing season begins.

It is imperative that guards be placed over exposed belts or chains in which workers or their clothing may become entangled.

Staff

No rule can be laid down regarding staffing requirements, because the quality and size of fruit and the skill of workers vary considerably. Naturally most growers will employ skilled staff if possible, but unfortunately at the fruit-harvesting period there are other large demands on labour and the grower has to make the most of what is offering. However, to get the best results, a nucleus of experienced graders and packers is essential.

Women or girls can easily do grading or packing; the work is interesting, pleasant, and profitable, and can be recommended to those wanting a change of occupation for 2 or 3 months. New packers should be instructed carefully at the beginning of a season and only when they have mastered the wrapping and packing procedure should they be allowed to try to attain speed. Good packing should never be sacrificed for speed of operation.

Male labour will be required for loading and unloading fruit, for feeding the sizer, and for nailing and wiring. It is good practice to have some of the staff capable of performing any of the different types of work. If the pickers are gaining on the packing shed, a picker should be transferred to the shed, or vice versa. One shed hand should be qualified both as a grader and packer, because the rate

PACKING SHED . . .

of grading varies according to the quality of the line—good fruit requires less grading time, but more packing time; poor fruit requires more grading time but less packing time. Growers should also endeavour to be able to readjust the staff in the event of a worker's absence.

Supervision

One person who understands the work thoroughly should be responsible for adjusting the size grader.

It is necessary to be quite sure that graders understand fully and can interpret the regulations in respect to colour requirements, russet and blemish tolerances, etc. The supervisor should check the fruit in the bins regularly.

The nailer-down should be instructed as to what type of pack is acceptable and to return faulty cases to the packer responsible. Not only will this save fruit—perhaps a whole line—from being rejected, but it identifies a faulty packer; or it may indicate the need for adjustments to the size grader.

The supervisor should see that the wirer understands his machine, that all cases are wired as close to the cleats as possible, that wires are tight, but not over-tight, and that they encircle cases evenly. Wire should not be used round the middle of a case to repair a split board—the board must be replaced.

Labels should be clean and well and securely applied; they must also be dry before cases are handled. All stamping or branding should be accurate, neat, and legible.

When good new cases are used temporarily as picking cases all precautions should be taken to keep them clean and they should not be used more than once for this purpose.

It should be made a rule to pack out and sweep clean each bin at least once, preferably twice, a day. Bins should not be allowed to become overfilled or jammed with fruit. All reject fruit should be disposed of regularly and the shed swept out thoroughly.

Fire-prevention equipment should be installed in a handy position, because if a fire breaks out in the shed—and with so much paper about that can happen easily—the work of completing the packing operations will be considerably disorganised.

At the conclusion of the season a thorough clean-up of the packing shed and surroundings should be made, all waste fruit should be destroyed, and machinery belts, particularly the main drive belt of the grader, slackened or removed in case children start the motor and perhaps cause an accident.

With a well-organised system, average worker ability, and willing cooperation, no great difficulty should be found in making a first-class and attractive job of the packing of a heavy crop of well-graded fruit. Success is achieved by close attention to many small but important details of the whole operation.

Control of Hogget Losses by Vaccination

By C. A. MARTIN, Inspector of Stock, Department of Agriculture, Tapanui.

ALMOST any farmer in west Otago who is approached on the subject of hogget losses on feed during winter will admit that he does lose a few. If he is asked to estimate the actual number, the reply is sometimes astounding, as losses on different farms vary from only an odd one to as high as 7 or 8 per cent. From an economic point of view the overall loss in this very small area of New Zealand is very serious.

WHEN asked why his hoggets die, the farmer invariably replies, "Inflammation," because he finds the dead sheep bloated and probably with bloodstained froth exuding from the nostrils. The calamity is that numerous farmers take these losses so much for granted that when keeping ewe lambs they make allowances for the number they expect to die during the winter while on turnips.

As a result of the present high prices for sheep and of the publicity given to the fact that something can be done to prevent these "mysterious" deaths, the farmers generally are awakening to the seriousness of these hogget losses.

Experience over the past two winters has proved that the great majority of these hogget mortalities are caused by either blackleg or enterotoxaemia, with enterotoxaemia deaths in the ascendency. Internal parasites cause very little trouble, as the farmers of this district control them by regular and systematic drenching with reliable drenches where necessary.

Principally hoggets were vaccinated during the winter and spring of 1947, when approximately 5000 were treated for blackleg and 2000 for enterotoxaemia. The results were very satisfactory and in every case losses were greatly reduced. Publicity was given to these good results from vaccination and as a result during the winter and spring of 1948 27,000 sheep (mainly hoggets) were vaccinated, 17,000 for blackleg and 10,000 for enterotoxaemia, and again the results were very satisfactory.

The system evolved for this vaccination work is as follows:—Every case of hogget mortality which is reported is investigated, post-mortems are carried out, and specimens taken for submission to the laboratory of the Department of Agriculture's Animal Research Station at Wallaceville. If blackleg or enterotoxaemia is confirmed, the farmer is advised of the vaccination work that can be done, and he may then choose whether the work should be carried out. (Invariably he is keen that it should be done.) At the same time the farmer is instructed in the technique of vaccination so that he may later do it himself.

The following case is worth noting, as it indicates the value of vaccination. It does not relate to hoggets, but it was as a result of blackleg being confirmed as the cause of serious hogget losses on this farm and subsequent excellent results obtained from blackleg vaccination of the hoggets that it was decided in September, 1948, to vaccinate 100 stud Southdown ewes on the same farm with blackleg vaccine. This farmer had had 100 stud Southdown ewes each year for 5 years and every lambing time had lost through "blood poisoning" never fewer than 14 and as many as 18 of the 100. The vaccine used was a 5 c.c. dose (2 c.c. is the normal dose) of blackleg vaccine prepared in cystine, the ewes being vaccinated approximately 3 weeks before they were due to begin lambing. Ninety-nine ewes lambed, and although a larger number than usual required assistance, not one was lost, but the last one to lamb, that then being 9 weeks after vaccination, died of blood poisoning. In this case vaccination undoubtedly saved a considerable number of ewes and their lambs.

Vaccination as a means of greatly reducing hogget losses has been found very satisfactory, and more and more farmers of west Otago are becoming keenly interested in this new phase of disease control.

BOOK REVIEW

"Machines for the Farm, Ranch, and Plantation:" A. W. Turner and E. J. Johnson

THIS book covers the selection, operation, care, and maintenance of the full range of American farm machinery, a range wider than that used in New Zealand, where farmers work with not only American but British and locally-made machines and require little mechanical barn equipment for handling fodder and manure. The book should be of interest to working farmers and mechanics as well as agricultural students, particularly the sections dealing with field servicing and reconditioning of farm machines. These sections are thoughtfully arranged, well illustrated, and should be valuable to farmers and mechanics in their daily work of keeping farm machinery in first-class order. The need for safety education in the use of machines is also recognised, for, as the authors state, "only persons who have been **instructed**—not **told**—how to operate a machine should be permitted to operate one."

—*P.W.S.*

McGraw-Hill Book Co., Inc., New York.

ALL-THE-YEAR-ROUND CARE TO PREVENT LAMBING TROUBLES

By A. D. M. G. LAING, Veterinarian, Department of Agriculture, Hastings.

THE most trying period of the farming year for the sheep farmer is lambing time, which may be defined as dating from about 3 weeks before the ewes are expected to begin lambing to when the lambs are about 14 days old, that is, when they have filled out a little. On most farms docking is not usually carried out much before this age, and losses at docking or tailing will therefore not be discussed in this article. Certain of the causes of loss, however, and these by no means the least important, owe their origin to factors occurring in the earlier months of the ewe's pregnancy, or even before conception, and the very great importance of sound sheep husbandry all the year round is thereby emphasised.

THIS article attempts to set out shortly the present knowledge about losses which occur at this time and to make suggestions for their prevention and for treatment of the causes.

Troubles causing these losses may be summarised as follows:—

Affecting Health of Ewe before Parturition

Pregnancy toxaemia (sleepy sickness, ante-partum paralysis, twin-lamb disease).

Hypocalcaemia (lambing sickness or milk fever).

Eversion of the vagina (bearings, red bag, etc.).

Affecting Health of Lamb after Birth, but Occurring while it is still in the Uterus

Pregnancy toxaemia.
Hypocalcaemia.

Affecting Ewe at and just after Parturition

Dystokias (difficulty in giving birth to the lamb).
Acute septic poisoning.

Affecting Lamb at Parturition and up to 14 Days after Birth

Dystokia (difficulty in leaving womb).

Exposure to hostile weather conditions.

Poor mothering ability on the part of the ewe.

Lack of vigour and vitality.
Acute septic poisoning.
Enterotoxaemia (pulpy kidney).
Arthritis.
Tetanus (lockjaw).

Both the accepted scientific terms for the various diseases and their popular names are used in the foregoing, but for convenience the scientific titles will be used in this article. In view of the increasingly scientific nature of farming, the desirability of this as a general practice is urged on farmers. Pulpy kidney, for instance, is a very misleading term for the disease enterotoxaemia, as a pulpy kidney is by no means an invariable feature after death, whereas the term enterotoxaemia, meaning roughly bowel poisoning, is accurate.

Affecting the Ewe

Pregnancy Toxaemia

Pregnancy toxaemia usually occurs 10 to 20 days before the ewe is due to lamb. She is dull, off her feed, and tends to lag behind if the mob is rounded up. Loss of control of the limbs develops, the eyes become glazed and sightless, and the animal staggers or walks in circles. She eventually collapses, becomes unconscious, and dies about a week after the first symptoms are observed.

This disease must not be confused with hypocalcaemia (milk fever). In most cases of milk fever there is considerable excitability and muscular tremors. This complaint is associated with sudden access to milk-forcing feeds such as young spring grass, whereas pregnancy toxaemia is usually associated with a drop in both the quantity and quality of the nourishment. Death usually occurs within a couple of days of contraction of milk fever. The calcium injection recommended later will bring about rapid recovery from hypocalcaemia, but if it has any effect in cases of pregnancy toxaemia, it is only transitory. If, therefore, there is any doubt about the complaint responsible for the animal's condition, the calcium injection should be used.

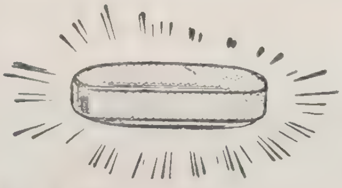
It is also worth noting that sheep suffering from pneumonia may stagger and walk in circles. Coughing and nasal discharge will usually occur in such cases, which are in any case relatively rare in springtime.

Examination of the carcass of an animal which has died from pregnancy toxaemia will reveal a pale, greasy liver. Very frequently twin lambs are present.

Treatment of affected ewes is not of great value. Molasses in ½lb. doses diluted in water, preferably administered by stomach tube, or 8oz. doses of 20 per cent. glucose in warm water injected into the loose skin inside the forelegs or the groin or into the rectum are often of help in cases which have been observed early.

Prevention of Pregnancy Toxaemia

Though there is much that is puzzling about pregnancy toxaemia, its



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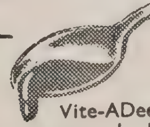

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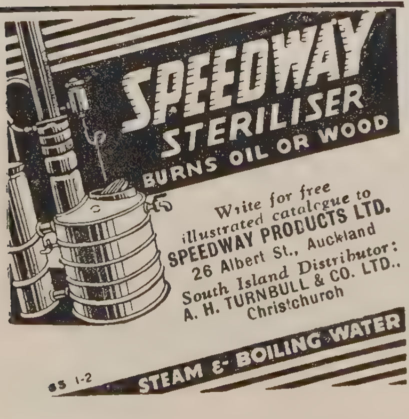

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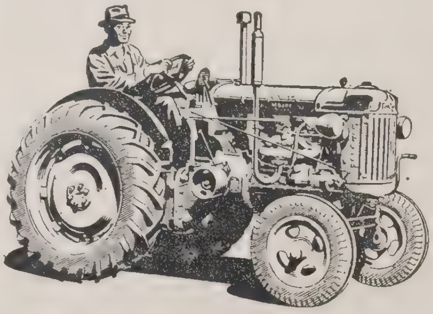

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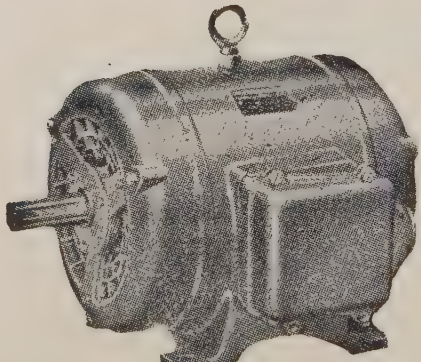

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onset is definitely associated with a lowering of nutrition in the latter part of pregnancy, and with the fact that the ovine foetus (or foeti) approximately doubles its weight during the last 6 weeks before lambing. At the same time the ewe has to begin making milk, which in itself is a considerable drain on the body resources. From a variety of causes the liver, which converts the body reserves of fat (needed because of lowering of available nutrition) into glucose, the only form in which it can be used, breaks down, and a general poisoning (hence the name pregnancy toxaemia) results. A pregnant ewe which has to "live on her own fat" is thus slowly, but quite inevitably, poisoning herself. Excessive condition, apart from its general undesirability, appears to render ewes more liable to pregnancy toxaemia.

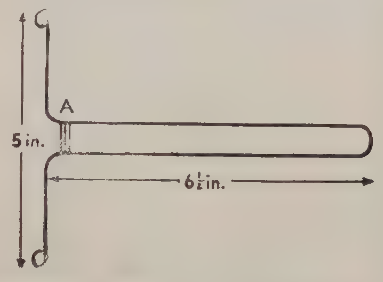
The particular importance of preventive measures for this condition is thus clear. When cases are observed among ewes every effort should be made to increase the nutrition. Young grass, barley, kale, and chou moellier are all helpful, but the change of feed must not be too sudden. If no such supplementary green feeds are available, good-quality hay sprinkled with molasses should be made freely available to the ewe flock. Gentle exercise is of considerable value and allows early cases to be diagnosed and set aside for treatment.

Essentially, however (and admitting that a few odd cases can always occur whatever the precautions), a large-scale outbreak of pregnancy toxaemia is evidence of lack of foresight on that particular property or of too great a trust in growing weather coming at the time it is needed. Or, to put it another way, the owner who manages his grazing, his animal husbandry, and his provision of reserves of sheep feed in such a way that his ewes are in hard store condition up to 3 weeks before tupping, are flushed on to suitable feed but not allowed to get beyond good store condition, and are kept at that through pregnancy with extra feed during the last month before lambing to compensate for the extra strain at that period, will not only have a high conception rate in his ewes, but will have nothing to fear from pregnancy toxaemia, however adverse the climatic conditions may be. Foot-rot, a condition which can be eliminated from any property by organisation and by taking advantage of present knowledge, should be cleared up, as the laziness resulting from foot-rot lameness is undoubtedly adverse to the health of the ewe.

Finally there is a certain amount of evidence that the mammalian female is peculiarly sensitive to iodine deficiency during pregnancy. The use of an iodine lick, therefore, would be sound practice; ½oz. of potassium iodide to 1cwt. of salt is the correct strength. Potassium iodide is relatively easily destroyed by daylight and exposure to weather and is of value only for 2 or 3 days after it is put out, and even then it should be fed in sheltered boxes. Not more than 10 days' supply (to be kept in a dark shed) should be mixed at a time. It may be mixed by spreading the salt on a cement floor, dissolving the potassium iodide in water and sprinkling it over the salt, and then mixing it in thoroughly with a spade.

Hypocalcaemia

Hypocalcaemia may occur at up to 6 weeks before the ewe is due to lamb. It appears to be associated with the commencement of functioning of the udder and the coming into action of the control centres which activate that gland. The symptoms are excitement, stiff, irregular movements of limbs, trembling (which may be very marked), loss of control, then loss of consciousness and death, all usually within 48 hours. Stomach contents may be vomited through the nostrils. These symptoms are somewhat similar to those of hypocalcaemia or milk fever in the cow. Colostrum milk, that is, milk at the time of birth, has a very high proportion of calcium, and blood samples from ewes affected with this condition have shown a deficiency in the amount of calcium in the blood and the symptoms exhibited are consistent with this fact.



Retentive device for treatment of eversion of the vagina made from about 21in. of No. 8 fencing wire. The doubled length of wire is inserted in the vagina and the gadget is secured by tying locks of wool to the two end loops. A is thin wire binding soldered on.

Examination of a carcass after death does not reveal any abnormality.

The remedy for hypocalcaemia in the ewe is simple and easy to administer. It consists of a subcutaneous injection of ½oz. of calcium borogluconate dissolved in 60 c.c. (2oz.) of water sterilised by boiling. The site of injection should first be cleaned with cottonwool soaked in methylated spirit. If possible, the injection should be at blood heat. The loose skin inside the foreleg or at the groin are both favourable places. Farmers are advised to consult their veterinary surgeon about this treatment, as there are several pitfalls.

Hypocalcaemia in the ewe is definitely associated with a sudden change from poor feed on to good feed at the time when the udder is beginning to function. It has occurred in spring in Hawke's Bay when, after a hard winter, spring rains have fallen and a quick pasture growth has taken place. Immediate prevention is therefore on the lines of "ironing out," over a few days, any improvements in feed, to allow the digestive and milk-controlling mechanisms of the sheep to adjust themselves. General prevention is of course on the same lines advised for pregnancy toxaemia.

Eversion of Vagina (Bearing Trouble)

Eversion of the vagina in pregnant ewes is quite common in New Zealand and occurs mainly in the North Island grazing country, though it occurs also in certain areas in the South Island.

Symptoms are the appearance a week to 4 weeks before lambing of a reddish, inflamed tumour at the vaginal opening below the anus. The tumour consists of the everted lining membrane of the vaginal passage, and its contents commonly include the bladder, usually full of urine. The affected ewe is dull and lags behind if the flock is driven. If the trouble is not attended to, gross inflammation ensues, urine cannot be passed, and the animal dies.

Treatment is to reduce and return the everted tissues. The bladder is first relieved by gentle pressure inward and upward. The parts are then carefully cleansed with a non-irritant, bland antiseptic, at blood heat if possible, and returned into place with gentle pressure by the hands. Anything likely to break or bruise the membrane should be avoided, including stitching, the use of safety pins, and even too-long fingernails, which, if they damage the skin, may result in conditions favourable for fatal septic poisoning.

If it is desired to use a retentive device more efficient than the tying of string across the vulva, the gadget illustrated on this page, which is made from No. 8 fencing wire and is of a pattern that has been in use for many years in certain districts, is very satisfactory for insertion in the vaginal passage. It has the advantage of bringing gentle pressure to bear where it is most needed, where eversion begins at the end of the vaginal passage nearest the head. It is so slim that the ewe can lamb past it, and it is easily sterilised by boiling. The gadgets can easily be made in quantity by setting up a home-made jig with 4in. nails hammered into a strong board. For obvious reasons care should be taken that there are no rough surfaces on the wire.

Though much has to be learnt about the causes of bearing trouble in ewes, it is generally associated with an excess of abdominal fat in the ewe, lack of tone in her body tissues, too much bulky, rank feed, and lack of exercise. These factors combine to decrease the amount of available space in the abdominal cavity for the gravid womb to expand into and to reduce the strength of the tissues surrounding the abdomen. The weakest points, the attachments of the vaginal passage, give way, resulting in an everted vagina. It is probable that laziness, which may cause a too-full bladder, difficulty in passing urine, and straining, may frequently play a part in bringing about the final stages of the eversion.

If the measures described under prevention in the portion of this article devoted to pregnancy toxaemia are therefore adopted, bearing trouble should not occur extensively. It is, however, a condition in which heredity may play a part. It is well known, for instance, in veterinary practice overseas that placid cows with roomy pelvises are the type most liable to eversion of the vagina, and it is a distinct possibility that some pelvis con-

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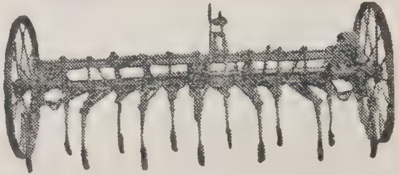

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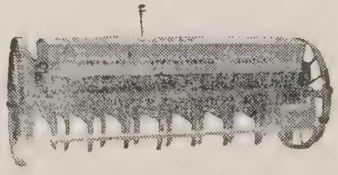

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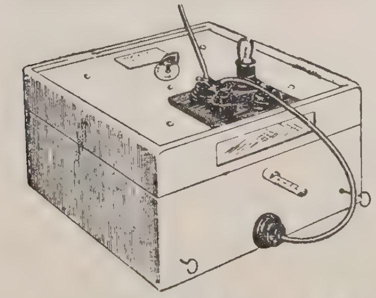

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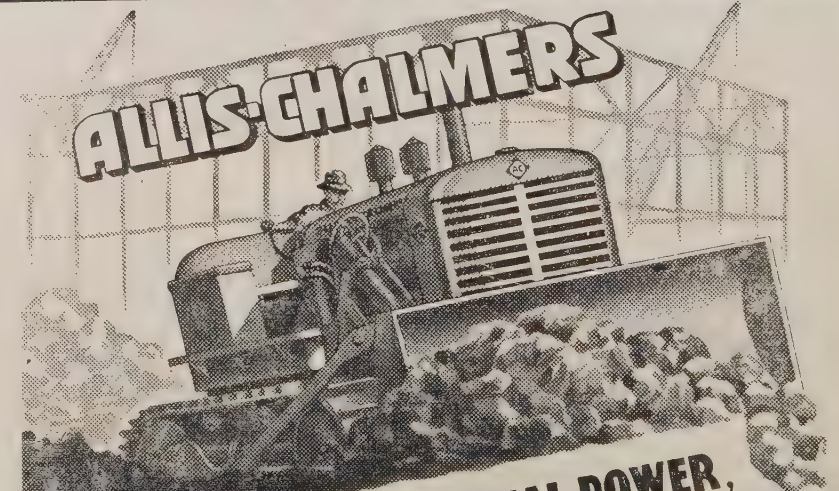

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formation of the Romney ewe has developed which may tend to this trouble.

Affecting Both Ewe and Lamb

Dystokias

Difficulties in giving birth are one of the principal factors in causing deaths of lambs at birth, and the results, direct and indirect, to the ewe are also a substantial cause of loss.

If the lamb is born normally, it leaves the womb and passes down the vaginal passage lying on its belly with the head first and both forelegs slightly in front; this is known as a normal anterior presentation. Birth can also take place normally if both hind legs pass out first and the lamb is lying on its belly; this is known as a normal posterior presentation.

Variations of these presentations result in dystokias (difficult births), as the lamb must be brought into a state of normal presentation as described above before it can leave the womb.

The commonest type of dystokia in the ewe is when the lamb has one or both forelegs bent back, with the head coming first. In such cases assistance has to be rendered by repelling the lamb far enough into the womb for the retained foreleg (or forelegs) to be brought out, when birth can take place. Transverse presentations (when the lamb lies across the womb) and breech presentations (when the lamb comes backward with the hind legs retained) sometimes occur, and also presentations with the lamb lying upside down.

The Romney ewe's size and relatively roomy pelvis make it possible frequently to adjust the abnormally-presented lamb into one of the two positions (normal anterior or normal posterior presentations) in which it can leave the womb, but such cases are not easy to deal with, though fortunately the commonest types of abnormal presentation (with one or both forefeet retained) are less difficult. The presence of twins, of course, can make the shepherd's task in such cases even more trying.

Though when flock ewes lamb in the open paddock, as they normally do, it is difficult to assure satisfactory antiseptic precautions, the following suggestions should be adopted **as far as possible** when assistance must be rendered to a ewe in labour:—

1. The external genitals should be cleansed thoroughly.
2. The hands should be clean, the nails short, and a suitable lubricant, such as liquid paraffin, should be used.
3. It is important that shepherds assisting ewes should not have to handle dead carcasses. The provision of rubber gloves for such work, to keep the shepherd's hands free from infection, is worth consideration.
4. Every possible care should be taken to avoid tearing or breaking the lining membrane of the genital organs. Such injuries are a potent source of septic infection. Lambing forceps of standard design, soft cotton cord to attach to forelegs, and the free use of bland antiseptics and lubricants will all help toward preventing injury, though their use in the open is not always possible.

As high as 70 per cent. of pedigree Southdown ewes require assistance at lambing. A large proportion of Romney flock ewes seem to need assistance in lambing, particularly in some seasons, and the absence of such assistance is probably one of the principal causes of lambs being born dead or so weak that they die shortly after birth. Sheep farmers should consider whether it might be economic to cull ewes which have difficulty in lambing without assistance and also the progeny of such ewes. If this is not done, on the analogy of the pedigree Southdown ewe, it is probable that the problem will get worse.

Foot-rot should be cleaned up, as the laziness resulting from this affection undoubtedly has an adverse effect on the health of the ewe.

Acute Septic Poisonings

The term acute septic poisonings is a convenient one to cover the several types of acute septic infections (blood poisonings) which cause deaths in ewes, and to a much smaller extent in lambs, during the lambing season. *Clostridium chauvoei* (the organism causing blackleg) and *Clostridium septique* (gas gangrene) are the principal causes of these poisonings. A characteristic of this group of germs is their ability to form resistant spores outside the animal body and in this form to exist almost indefinitely in the soil, in which they are present in enormous numbers. Certain as yet unknown factors render them more deadly in some localities than others, and ewes lambing in such paddocks, particularly if assisted, commonly become infected and die. Death usually takes place 1 to 4 days after infection. The tissues round the vulva are swollen and purplish and full of a dark, bloody fluid. Recoveries are very rare.

Treatment is of little avail. As this group of germs cannot live in the presence of oxygen, the use of an oxygen-bearing antiseptic such as hydrogen peroxide is indicated. Very heavy dosages with some of the sulpha drugs or penicillin under veterinary supervision may give results in the very early stages of this disease, but are not economic for flock ewes.

Prevention of acute septic poisonings in lambing ewes is best attempted on the following lines:—

(a) By precautions as advised in the section of this article on dystokias.

(b) Particularly where deaths are in ewes which have not been assisted and are confined to ewes in certain paddocks, the ewes should be inoculated with blackleg vaccine prepared at Wallaceville Animal Research Station. Inoculation during May will give protection during the ensuing lambing season. Sheep farmers who suffer losses of this nature should discuss preventive measures fully with their veterinary surgeon, as special vaccination arrangements to prevent lamb deaths from this cause may also be necessary. A laboratory diagnosis of the disease through muscle tissue from a ewe which has died is desirable.

PREVENTION OF LAMBING TROUBLES . . .

(c) Ground in the neighbourhood of sheepyards, holding paddocks, etc., is likely to present danger of infection of ewes at lambing and should be avoided.

(d) Dead carcasses should not be left to disintegrate and infect the soil. In particular, stock which have died of any form of septic poisoning should be burnt or buried very deeply.

Affecting Lambs Only

Exposure to Adverse Weather

The provision of suitable shelter belts and good drainage help to alleviate climatic disadvantages of a district. A newly-born lamb which spends the first minutes of its existence in a puddle of surface water will obviously have its chance of life adversely affected.

Poor Mothering

Good mothering, or lack of it, has a marked effect on the life and health of the lamb. Some 2-tooth ewes' mothering is poor, and the development of the instinct in different breeds of sheep varies. Efficiency at encouraging mothering up is an important part of the shepherd's work, and if a ewe is reluctant to take her own lamb, quick measures to restrain the ewe and stop her driving the lamb away are essential. It would seem desirable that flockmasters should watch their ewes carefully and cull out those which show a tendency to be bad mothers and also ewe lambs which survive from such ewes.

Lack of Vigour in Newly-born Lambs

Little is known about the cause of lack of vigour in newly-born lambs. The time between birth and the lamb's rising to its feet or between birth and first suckling (assuming a complaisant ewe) has been taken as a measure of the vitality of the lamb at birth. Efficient shepherding will do much to prevent mortality as a result of lack of vigour. It is probable that conditions such as pregnancy toxaemia or milk fever in the ewe, even to a slight extent and with no visible symptoms, may tend toward a lack of vitality in the lamb at birth.

Enterotoxaemia

Enterotoxaemia is popularly known as pulpy kidney because in many cases the kidneys break down into a soft, pulpy mass shortly after death. Another popular name in U.S.A., suggestive of an important factor in the causation, is "over-eating disease." It is less common in lambs under 14 days old than in lambs over that age.

The disease is caused by the absorption from the bowel of toxins produced by a germ (*Clostridium welchii*, type D.). It is almost invariably associated with a fairly sudden increase in the quantity and quality of the food, and it is the vigorous, well-conditioned lambs which are affected. Clots of curdled milk are frequently present in the fourth stomach of suckling lambs. Excess of yellow or reddish fluid in the pericardium (the transparent envelope surrounding the heart) is very characteristic. The kidneys may be blotchy and are frequently pulpy. Final diagnosis of enterotoxaemia is by laboratory examination of bowel contents.

Symptoms before death vary from none (that is, sudden death) to staggering, blindness, wandering in circles, or paralysis. Recoveries occur, particularly if the lamb is removed from the ewe and placed in a sheltered spot, such as the woolshed. In mild cases even a few hours' starvation has a marked effect. Docking carried out when cases of this disease appear often gives a setback which stops the outbreak. Yarding ewes and lambs for one day in four is an old but fairly effective remedy.

Preventive methods recommended are:—

(a) By sound feeding. Avoid conditions which will cause a sudden increase in the ewe's milk. In the case of older lambs all changes to richer feed should be spread over some days, gradually increasing the time each day.

(b) By inoculation with enterotoxaemia vaccine. When deaths occur in young lambs the ewe is inoculated during pregnancy, the immunity being given to the lamb through the milk. If the deaths are in older lambs, the lambs themselves are inoculated. Vaccination of ewes is not an absolute preventive, but should be made use of if the deaths exceed 5 per cent. Sheep farmers shoud discuss this rather complicated question with their veterinary surgeon.

Arthritis

Arthritis means, literally, inflammation of a joint, which is the junction between two or more bones. This junction is totally enclosed by a bag composed of dense elastic material, termed the joint capsule. The joint capsule is lined in the inside with a special type of skin, termed the synovial membrane, and the ends of the bones forming the joints are also so lined. The synovial membrane manufactures the joint oil which acts as a lubricant.

Arthritis can take two forms: One, the milder, when the synovial membrane becomes congested and inflamed, and a more serious type, when the whole joint cavity becomes filled with pus and much swelling takes place. In both types, of course, there is considerable lameness. The joints most usually affected in lambs are the knee, the back, the stifle, and the shoulder. Lambs may be completely paralysed. Recovery in the milder form is almost invariable, and a good mother will look after her lamb. Where there are swelling and pus, however, recovery is slow, and the joint may be permanently swollen and the limb wasted away and partially useless. Such cases are one of the commonest causes of lambs being rejected for export at works, with a consequent monetary loss to the farmer.

The commonest cause of this trouble is a germ in the soil known as *Erisipelothrix rhusiopathae*.

Modern veterinary treatment with penicillin injections in the early stages is certainly economically justified for stud lambs, though possibly not for ordinary flock lambs.

In very young lambs the navel cord will have been the probable avenue of infection. Healthy, clean lambing paddocks are therefore the best preventive. It would be quite sound practice to swab the navel cords of newly-born lambs with hydrogen peroxide. As chilly conditions appear to increase the incidence of arthritis, especially after docking, the importance of shelter should be noted.

Tetanus

Cases of tetanus or lockjaw are a not uncommon sequel to docking carried out under bad conditions, but are rarer in very young lambs. The symptoms are stiffness and complete rigidity of certain groups of muscles, notably the cheek muscles, hence the title lockjaw.

Recoveries are very few, and as this disease is very painful, immediate destruction of the lamb is a humane course once the diagnosis is certain.

The causal organism is the tetanus germ, *Clostridium tetani*, which occurs in spore formation in large numbers in the soil. Wounds, particularly dirty wounds, are the means of entrance into the body. The germ produces a toxin which acts on the nervous system, thus causing the disease. This is why any known treatment of tetanus is so unsatisfactory. It is a disease which can be immunised against, but the economic factor and the very low incidence render the value of such immunisation very doubtful. The tetanus germ is unable to live in oxygen, and if cases occur in very young lambs, swabbing the navel cords of newly-born lambs with hydrogen peroxide, which gives off free oxygen, would be sound preventive treatment.

Conclusion

The measures suggested for the prevention of lamb losses call for extra work, both mental and physical, and this must, of course, be balanced in an economic sense against the losses; there is no point in spending £2 to save £1. There is, however, one aspect of the problem which should be considered. Disease incidence is increasing. In a farming system based on the maximum production per farmer, not per acre, some losses must be regarded as inevitable. A point may, however, be reached when gradually-increasing losses will bring about a revision of ideas as to the wisest policy.

New Agricultural Adviser to U.K. High Commissioner

MR. D. S. HENDRIE, who recently began a tour of duty as Agricultural Adviser to the United Kingdom High Commissioner in New Zealand, was born in Ayrshire, Scotland, and studied agriculture at Glasgow University, the West of Scotland Agricultural College, Cambridge University School of Agriculture, and at Ontario Agricultural College, Canada. He has had practical experience of farming in Scotland and England.

Among other duties in New Zealand, Mr. Hendrie hopes to make a special study of ways in which farming and agricultural research work in New Zealand might be applied with advantage in Britain.

ALFA CONTINUOUS BUTTERMAKING PROCESS

A PROGRESS report of trials conducted during the period October, 1947, to May, 1948, at the New Zealand Co-operative Dairy Company's factory at Waharoa with equipment for the Alfa continuous buttermaking process was published in the July, 1948, issue of the "Journal" in an article by Dr. F. H. McDowall, deputy-chairman of the technical sub-committee supervising the investigation and chief chemist of the Dairy Research Institute (N.Z.), and G. M. McWhirter, Dairy Instructor, Department of Agriculture, Matamata. The second progress report, which deals with the results of trials conducted from May, 1948, to February, 1949, and which sets out the conclusions formed by the technical sub-committee of the suitability of the process for New Zealand conditions, has been compiled by the same writers and is published below.

THE success of the Alfa continuous buttermaking process depends first on the efficiency of water removal from cream by the concentrator to maintain a steady and sufficiently-low moisture content in the "heavy" cream and the resultant butter.

As stated in the first report of the process, during the 1947-48 trials it was sometimes found impossible to reduce the moisture content below the required 16.0 per cent. to enable butter of legal composition to be made. Further, where the moisture content of the heavy cream was reduced below 16.0 per cent. by the concentrator there was a drift in moisture content of this cream which at times amounted to a variation of more than 1.0 per cent. moisture in the butter. This necessitated constant checking of the moisture content of the heavy cream. Satisfactory results, however, were obtained by adding skimmed milk to the heavy cream in the mixing vat through the aroma-addition pump.

Throughout the period covered by the present report these moisture control difficulties have been paramount. During the whole of the winter period from May to October 6, 1948, it was seldom found possible to reduce the moisture content of the heavy cream to below 16.0 per cent. This applied to all types of cream available.

In the period October 6, 1948, to January 31, 1949, the moisture content of the heavy cream was reduced below 16.0 per cent. with one type of cream, but with other types satisfactory moisture control was not obtained.

The following types of cream were available at Waharoa:—

Type 1: Night cream from a milk-powder factory—cream separated from milk in the factory at 95 degrees F., cooled to 55 degrees F., and held overnight in the neutralising vats.

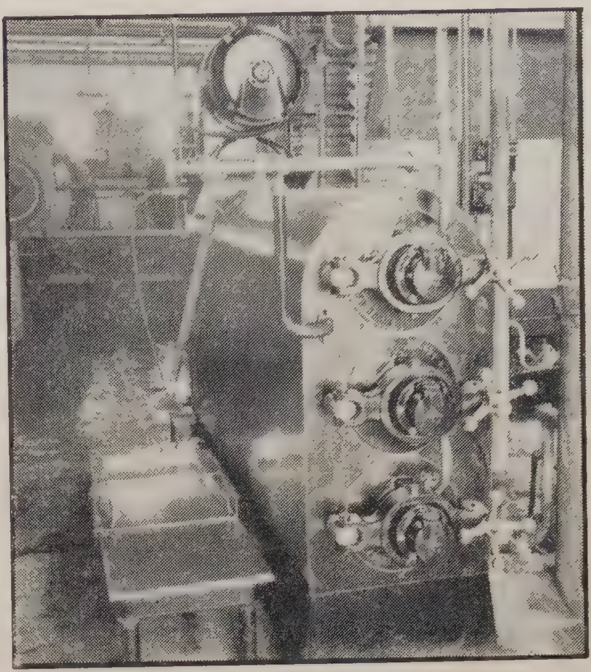
Type 2: Morning cream from a milk-powder factory—cream separated from the morning delivery of milk.

Type 3: Casein-factory cream—bulked night and morning milk separated at 95 degrees F. in the casein factories and transported to the Waharoa butter factory.

Type 4: Farm-separated cream.

With cream of types 2, 3, and 4 it was not found possible consistently to reduce the moisture content of heavy cream to below 16.0 per cent. With cream of type 1 satisfactory moisture control was obtainable on most days after October 6, but even with this cream the moisture content could not be reduced some days to below 16.0 per cent., and it was therefore not possible to make Alfa butter of legal composition.

On 2 days all four types of cream were passed in succession through the concentrator under constant conditions of operation. The results obtained, given in Table 1, show that though the fat content of the normal cream was having some influence on the moisture content of the heavy cream, this was not the controlling factor.



The transmutator used in the Alfa process, showing on the left the butter outlet and vibrator table on which boxes are placed when being filled.

TABLE 1—MOISTURE CONTENT OF HEAVY CREAM FROM DIFFERENT TYPES OF NORMAL CREAM

	November 22, 1948		November 23, 1948	
Type of cream	Fat content of cream Per cent.	Moisture content heavy cream Per cent.	Fat content of cream Per cent.	Moisture content heavy cream Per cent.
1 ..	50	14.5	48.5	14.6
2 ..	43.5	16.4	41.0	17.0
3 ..	46.5	16.5	44.5	16.4
4 ..	40.5	17.0	38.5	17.5

On November 22, 1948, for example, it was not possible to reduce the moisture of the casein-factory cream (46.5 per cent. fat) to below 16.5 per cent. It would therefore appear that the more successful results with evening cream from the milk-powder factory were due not so much to the somewhat higher fat content as to some intrinsic difference in the nature of the cream, possibly caused by the conditions of holding it at the comparatively-low temperature overnight.

Reducing Throughput of Concentrator

It was not found possible to overcome the moisture control difficulties by reducing the throughput of the concentrator. The capacity was reduced by means of various combinations of top and bottom nozzles in the concentrator and also by raising the back pressure at the heavy cream outlet. On a number of occasions the capacity of the concentrator was lowered to the stage where it could not provide sufficient heavy cream to keep the transmutator in operation, but even under these conditions the moisture content could not be reduced to the legal limit of 16.0 per cent.

During the period under review it was found that when degree of reduction in moisture content was satisfactory there was less drift in moisture content of the heavy cream during the run than had been the case in the 1947-48 season and it was possible to control moisture content within fixed limits. On many occasions the control within these fixed limits was obtained by use of the vernier adjustment only.

The conditions of cream treatment in the vacreator at Waharoa were recorded daily throughout the 1947-48 and 1948-49 seasons. These conditions were not significantly different for the two seasons. The greater difficulties with moisture control in the 1948-49 season cannot therefore be attributed to variations in conditions of cream treatment. They would appear to be associated with changes in the nature of the cream emulsion from year to year.

Reports from overseas on the operation of the Alfa concentrator indicated that difficulties in reducing moisture content were not usual. The main difference between butter factory practice in New Zealand and that overseas is the use in New Zealand of the vacreator vacuum pasteuriser for treatment of cream. Direct comparisons of the concentration of flash-pasteurised and vacuum-pasteurised cream from the same batch were not possible under the commercial conditions of factory operation at Waharoa. Some comparisons of the effect of vat pasteurisation with vacuum pasteurisation were made. The cream was pasteurised in 10-gallon cans in a boiling-water bath to a temperature of 175 degrees F. It was then cooled to 130 degrees F. and was transferred direct to the balance tank.

The moisture content of the heavy cream from the vat-pasteurised cream on the average was 3 per cent. lower than for the heavy cream from the vacreator-treated portion. However, as there was evidence of some oiling off of the vat-pasteurised cream, it does not follow that the same results would be obtained from flash-pasteurised cream.

For the purpose of comparing the effect of flash pasteurisation with vacuum pasteurisation on the moisture control of the heavy cream the concentrator was transferred to the Dairy Research Institute. The results of 3 days' trial are shown in Table 2.

TABLE 2—COMPARISON OF MOISTURE CONTENTS OF HEAVY CREAMS FROM FLASH-PASTEURISED AND VACUUM-PASTEURISED CREAMS

Date	Fat content of		Moisture content of heavy cream from		Difference
	Flash-pasteurised cream Per cent.	Vacreator-treated cream Per cent.	Flash-pasteurised cream Per cent.	Vacreator-treated cream Per cent.	
8/2/49	37.5	34.0	13.0	15.6	2.6
9/2/49	39.5	34.5	13.6	16.4	2.8
10/2/49	36.0	34.0	14.0	15.4	1.4

The moisture content of the heavy cream from vacreator-treated cream was 1.4 to 2.8 per cent. higher than for the heavy cream from flash-pasteurised cream. The fat content of the vacreator-treated cream was slightly lower because of the dilution with steam condensate, but experience with the concentration of cream of varying fat contents had indicated that differences in fat content of cream of this order had a much smaller influence on moisture content than those recorded in Table 2.

With flash-pasteurised cream there was a tendency for downward drift in moisture content of the heavy cream during the run, whereas with vacreator-treated cream there was more usually an upward drift.

Conditions of Vacreator Treatment

In view of the finding that moisture control difficulties in the Alfa process can be caused by vacuum pasteurisation of the cream, it is of interest to study whether variations in conditions of vacreator treatment affect the moisture control. Comparisons over 4 days showed, contrary to expectations, that variation of intensity of steam distillation of the cream without change in other conditions of operation of the vacreator had no effect on the moisture content of the heavy cream.

Variation in the vacuum applied in the first separating chamber of the vacreator imposes a variation in the tension on the equilibrium valve lever which conceivably could cause an alteration in the physical properties of the cream. Comparisons were made on cream from one bulk supply vacreator treated with applied vacua on the first separating chamber of 10½ and 20½in. The results, given in Table 3, show that the moisture content of the heavy cream is greatly influenced by the conditions of vacreation treatment of the normal cream.

TABLE 3—EFFECT OF CONDITIONS OF VACREATOR TREATMENT OF NORMAL CREAM ON MOISTURE CONTENT OF HEAVY CREAM FROM ALFA CONCENTRATOR

Date	Vacuum applied in first separating chamber Inches of mercury	Average moisture content of heavy cream Per cent.
15/2/49	10.5	15.5
	20.5	17.1
	10.5	15.3
16/2/49	20.5	18.9
	10.5	16.7
	20.5	18.5
17/2/49	10.5	16.2
	20.5	17.1
	10.5	16.5

High vacuum in the first separating chamber leads to higher moisture content in the heavy cream. This may be caused by a disruption of the fat globules at the equilibrium valve because of the increased tension on this valve, or it may be caused by the greater explosive effect of the evaporation of moisture as the cream passes from a region of low to a region of high vacuum. Even with the low vacuum on the first separation chamber, however, the moisture content of the heavy cream was above 16.0 per cent. on 2 of the 3 days on which the trial was made.

Hence, though high vacuum on the first separating chamber does influence moisture content of the heavy cream, the main cause of the difficulties with moisture control appears to be some factor inherent in the process of vacuum pasteurisation, whatever the conditions of treatment.

There is at present in New Zealand no satisfactory alternative to vacuum pasteurisation of cream for buttermaking. The investigation therefore appears to have demonstrated that the concentrator of the Alfa process is deficient as a means of preparing heavy cream for buttermaking from New Zealand vacreator-treated cream.

Effect on Moisture Control of Adding Water

The fact that the persistent trouble with moisture control first arose when dilution of cream with water was greatest suggested that the difficuly might be due to presence of too much water in the cream, but it has not been possible to find a direct connection between presence of added water and high moisture content in the concentrated cream. On one occasion when the concentrator had been running steadily for 2 hours on a certain class of cream 10 per cent. of water was added to the last 100 gallons. No changes were made in the adjustments of the concentrator. It was noted that there was a slight increase in the rate of flow of the cream to the concentrator, but the back pressure on the cream outlet remained constant. The average of 6 moisture tests before adding water was 16.0 per cent. and the average of 5 moisture tests after adding water 16.1 per cent.

Though it may be true that large additions of water can affect moisture content of the heavy cream, it is apparent that small additions do not. The amount added in the trial, 10 per cent., is higher than can possibly be present in many of the creams which have failed to give a heavy cream of lower than 16 per cent. moisture content. The difficulties encountered during the 1948-49 season could not have been caused by the presence of added water in the cream.

Sludge Deposition

Sludge deposition in the concentrator bowl from winter-produced cream was not as troublesome as had been expected. There have, however, been some repetitions of extensive sludge deposition from cream of originally relatively-low acidity and neutralised in the normal way. (This was referred to in the previous report.*) It appears that this sweet-curdled cream would be more difficult to "concentrate" than medium-acid cream neutralised to the normal churning acidity, namely 0.08 per cent. of lactic acid.

Butterfat Losses in Skimmed Milk

The results for butterfat content of skimmed milk from vacreator-treated cream for the period under review have been similar to those for the 1947-48 season*.

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* McDowall, F. H., and McWhirter, G. M., "Alfa Continuous Buttermaking," New Zealand Journal of Agriculture, vol. 77, pp. 15-17, and Dairy Research Institute (N.Z.) Publication No. 214.

In the trials with vat-pasteurised cream the fat content of the skimmed milk was consistently of the order of 0.15 per cent., compared with 0.80 per cent. for the skimmed milk from vacreator-treated cream.

In the comparison of flash-pasteurised with vacuum-pasteurised cream the difference in the extent of fat loss was smaller—0.40 to 0.50 per cent. for flash-pasteurised cream, compared with 0.70 to 0.80 per cent. for vacuum-pasteurised cream. There were indications that the use of a high vacuum in the first separating chamber of the vacreator caused a slight increase in fat content of the skimmed milk from the concentrator.

Salt Content Control

As was mentioned in the first report, uniformity in the salt content of Alfa butter can be obtained only when the salt is dry and free flowing. It has been found an advantage to warm the ground salt overnight in a container on an electric hot plate. With salt in good condition it has been found possible to maintain the salt content reasonably uniform over a day's run of 90 boxes of butter.

Packing of Alfa Butter

No further attempts to improve the system of packing of Alfa butter have been made. It has been found an advantage, however, to insert the side papers in the box before inserting the end papers. This prevents the papers from becoming dislodged by the action of the vibrator and also prevents the semi-liquid butter from flowing behind the folds of the side papers. The latter advantage is important, because it allows the wrappings to be removed more easily and cleanly from the block of butter after freezing.

Operation of Alfa Transmutators

After the development of leaks in the wall of one of the cylinders of the transmutator the Alfa-Laval Separator Company supplied two new cylinders and rotors. These new parts have been entirely satisfactory. During the period under review there has been no mechanical trouble in the operation of the transmutator.

The temperature conditions in the running of the transmutator, as quoted in the previous report, have been found applicable during the 1948-49 season.

Quality of Alfa Butter

Up to December 24, 1948, 3678 boxes of freshly-made Alfa butter had been graded. Their distribution over the grades is as follows:—

Grade	Boxes
93	619
92½	40
92	2427
91½	355
91	136
90½	4
90	97

These butters have been made mainly during the period of normal manufacture of high-grading, churned butter. The gradings during the 1948-49 season have been rather better than for the 1947-48 season, though most of the cream used has been night cream, which would be expected to show stronger feed taint than mixed cream. The lower temperature of chilling, made possible by the installation of the automatic compressor, has improved the grade because of its effect on the body of the butter, but it has not changed the characteristics of the butter under warm conditions.

Gradings of Butter after Storage

Butter was made by the Alfa process and by the conventional churning process from portions of the same batch of cream.

The butters were graded fresh and after 4 and 8 months' storage. The results of the 5-day comparison are summarised in Table 4.

It will be noted that the gradings of both the Alfa and churned butters at 8 months are not markedly different from those at 4 months. This absence of change over the second 4-month period may be due to the shorter time of holding for thawing, which for the 8 months grading was only 3 days. There is no evidence from the results in Table 4 to indicate that Alfa butter has better keeping properties than well-made churned butter. In general, it may be said that the churned butter retained its buttery flavour, but gradually developed a stored flavour, whereas Alfa butter lost its characteristic condensed-milk flavour and tended to become metallic and insipid in flavour.

TABLE 4—COMPARISON OF GRADINGS OF ALFA AND CHURNED BUTTER FROM SIMILAR CREAM

Comparison No.	Grade of Alfa butter			Grade of churned butter		
	Fresh	4 mths.	8 mths.	Fresh	4 mths.	8 mths.
1	88	87	88	92	89½	91
2	90	87	88	92	90	91
3	90	89	90	92	90	91½
4	90½	88	88	92	90½	91
5	90	89	88	92	90½	91
Average	89.7	88	88.4	92	90.1	91.1

In storage trials with Alfa and churned butters from the same day's cream the boxes of butter were taken from the day's run of Alfa butter and from the succeeding day's make of churned butter. They do not necessarily represent butter from the same class of cream, but are reasonably comparable, as the output of churned butter was of uniform quality. The grading results are given in Table 5.

TABLE 5—COMPARISON OF ALFA BUTTER WITH CHURNED BUTTER FROM THE SAME DAY'S CREAM

Type of butter	Average grade of butter		
	Fresh	4 mths.	8 mths.
Alfa (18 butters) ..	92.2	91.1	90.0
Churned (16 butters) ..	93.3	92.4	91.75

Patting after Frozen Storage

If it is to be satisfactory for the New Zealand export trade, Alfa butter must be suitable for passing through a butter-patting machine after frozen storage.

It was found that thawed Alfa butter was handled satisfactorily by two types of patting machines now in use. There was no leakage of water in the patting machine even at the low temperatures of 52 to 54 degrees F.

Microscopic examination showed that the water droplets in the patted Alfa butter were still very small and large droplets such as are found in patted churned butter after freezing were absent.

In general, it could be said that Alfa butter is satisfactory for direct repatting after frozen storage. The patted Alfa butter has excellent physical appearance and good spreadability, but shows the same tendency as fresh Alfa butter to become oily in appearance at warm temperatures or under pressure. There are indications, however, that Alfa butter may be more difficult to handle in blending machines than churned butter.

Shipment to United Kingdom

Four shipments of butter comprising in all about 67 tons have been sent to the United Kingdom. It is necessary to await receipt of the detailed results of the examination of these shipments before reporting on the reaction of the butter purveyors and consumers in the United Kingdom. The indications from preliminary reports are that Alfa butter has not found favour with the British butter trade.

Bacteriological Counts

Counts made at the Auckland grading stores on a number of butters indicate that both types of butter were of fairly low bacterial count, but that the count for Alfa butter was on the average slightly lower than that for churned butter. The difference in bacterial count would not appear to be of any particular significance.

Copper and Iron Content

The copper content of the Alfa butter has been about twice that of the churned butter, apparently because of the elimination of a portion of the copper in the buttermilk in the normal churning process. There was no difference in the iron content of the two butters.

Power Consumption

Data of power consumption were recorded for 5-hour runs over a period of 5 days. Meter readings were taken during the runs, but they do not show the power consumption during the starting-up period.

The power requirements for the different sections of the Alfa process equipment were as follows:—

	Boxes of butter per killowatt-hour
Transmutator	3.4
Concentrator, mixer, cream pump, and vibrator	3.5
Brine pump and agitator	5.0

The transmutator figures may be compared with the average 2.8 boxes per killowatt-hour for normal churning, but this figure includes power consumption during washing the churn. Without full data for power consumption for the churn filling, vat filling, cooling, etc., of cream for the conventional process a complete comparison of power costs is not possible. The above results show, however, that the transmutator uses nearly as much power per unit weight of butter made as the conventional churn.

Refrigeration

Direct comparison figures for refrigeration are not available, as there are no data for refrigeration used in the normal cream cooling. These figures will depend on the temperature of the cooling water and on the efficiency of the water cream cooler. The refrigeration required for the Alfa process is a fairly constant amount, as the butter mix must be cooled from 130 degrees F. to 50 degrees F. by refrigeration alone. The brine flow has been measured by a flow meter over a whole day's run. The amount of heat removed from each box of butter was 5160 B.T.U.

Conclusions

The results that have been recorded in both this and the first progress report are considered to be a sufficiently-extensive trial of the Alfa process to justify the following conclusions:—

1. **The general immediate adoption of the process in New Zealand is not possible because of the difficulty in the control of moisture content of heavy cream from vacreator-treated normal cream.**

2. The yield of Alfa butter is higher than the yield of churned butter because of the somewhat lower rate of percentage fat loss and of the higher curd content. The latter advantage is nullified when the wash with chill water is omitted in the making of churned butter.

3. The process appears to have little to offer in the way of savings in power, refrigeration, and labour costs.

4. The quality of the butter in the fresh state is considered to be less attractive than that of churned butter. The keeping quality of Alfa butter also appears to be somewhat inferior to that of New Zealand churned butter.

5. Alfa butter after frozen storage can be handled satisfactorily in butter-patting machines. The patted butter at cool temperatures has an attractive appearance, good spreadability, and excellent moisture distribution. It has, however, the same tendency to become oily in appearance under warm conditions.

◆

Bledisloe Ahuwhenua Trophy Won by Kaitaia Farmer

THE Bledisloe Ahuwhenua Trophy, a silver cup presented by Viscount Bledisloe in December, 1932, for annual competition among Maori farmers on Maori land development schemes, has been won this year by Mr. Eruera Hoera, of Takahue, Kaitaia. Mr. Waerata Harris, of Tarata, Taranaki, who has a small but highly-productive farm once overrun with weeds, was second, and Mrs. E. F. Clements, of Tauranga, who also has brought into high production an area formerly abandoned to weeds, was third.

In announcing the results the Minister of Maori Affairs, Mr. P. Fraser, said that in the opinion of the judge, A. V. Allo, Instructor in Agriculture, Department of Agriculture, Tauranga, Mr. Hoera had done an exceptionally-good job in breaking in a farm from standing bush.

"The financial assistance he has received from the Department of Maori Affairs has been comparatively little," said Mr. Fraser. "All his debts have been repaid and he has a substantial sum to his credit. Most of the work has been done single-handed and the farm today could be regarded with pride by any farmer in the Dominion.

"Mr. Hoera has developed his farm in 20 years into a highly-productive property. He has been a consistent entrant for the trophy and was placed third in 1941 and again in 1945. The judge described Mr. Hoera's farm as easily the most difficult piece of country farmed by any of the competitors, and the standard of pasture and pasture management and the quality of stock are of a very high order. This farmer can truly be termed a 'son of the soil,' which is the meaning of Ahuwhenua."

Mr. Fraser said he had been told that the garden of Mr. Waerata Harris, the winner of the second place, was a blaze of flowers, and on the property were a well-kept orchard and vegetable garden.

Special mention had been made by the judge of the cowshed on the property of Mr. Paul Toroa, Ruatoria, who was placed fourth. The judge had said it was the cleanest he had ever seen and that it was an outstanding example of a well-kept dairy shed.

"I should like to pay particular credit to the womenfolk," said Mr. Fraser. "I have been told that there was evidence of a high standard of house-keeping, with well-stocked shelves of preserved fruit. The houses of all competitors had the appearance of comfort. All competitors showed a genuine interest in farming and appeared to have a remarkable knowledge of the latest methods of farming. They deserve the utmost credit for the work they have done."

Weeding and Cultivation Pay

THE accompanying photograph illustrates very emphatically the benefits of weeding and cultivation. In this 4-acre block of asparagus planted last year the owner was unable to attend to weeding and cultivation except for the first 10 yards of each row. The rest of the block became overgrown with fat-hen, and not until late in the summer was the owner able to clean up the ground. The result is that where the block was attended to, the asparagus is 4 to 5ft. high in luxuriant growth; elsewhere growth is sparse and spindly.

—*S. FREW, Orchard Instructor, Department of Agriculture, Blenheim.*

Pig Houses Made from Concrete Blocks

GOOD housing for pigs is a necessity today and it is now recognised that the better the accommodation provided for pigs the better the production results from them. Though concrete is the most satisfactory material for building piggeries, the construction of concrete walls with boxing is difficult for those who are not experienced in the work. An easier method of building concrete pig houses is possible by the use of concrete or hollow-stone blocks, and in this article I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington, describes how pig producers may build their own concrete pig houses with these blocks.

CONCRETE blocks can either be bought or made on the farm in one of the moulds available on the market for the purpose. These blocks are made extensively by commercial manufacturers and they can be obtained in most districts at a fairly reasonable cost.

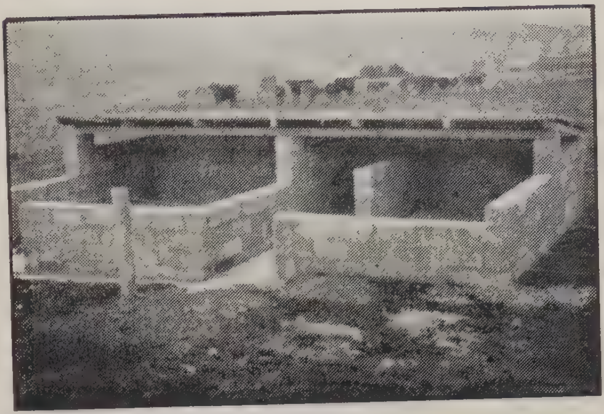
The number of blocks required for any building is easy to calculate. The size of the hollow concrete blocks is 18in. long by 9in. high. The thickness varies, as blocks made in a hand mould are usually 6in. thick, but those made in a block-making machine are 9in. This, of course, affects only the thickness of the wall. A block measuring 18in. by 9in. has an area of about 1 sq. ft., so the number of blocks required will be about equal to the number of square feet in the walls of the building, which is calculated by multiplying the length by the height in feet of all walls.

A certain number of half blocks must be provided for, roughly one to each course of blocks. These can be purchased from the manufacturers or made in the hand mould, which is adaptable for the purpose.

Making the Blocks

If the necessary time is available, it is much cheaper to make the blocks on the spot than to buy them ready made. Two men can make about 150 blocks between morning and evening milkings. If the work of making blocks is started in good time before building is begun, the blocks can be made as time is available. If a good shed is handy, it is a useful occupation in wet weather. In some districts moulds can be hired from the local district pig council.

Sarking is essential under a currugated-iron roof. Old sacks are satisfactory for the purpose and should be nailed to the purlins before the iron is put on.



A neat two-unit piggery built of hollow-centre concrete blocks. Note the method of capping the walls with cement plaster.

An important point in the moulding of the blocks is that a dry mix of concrete must be used; this means that too much water must not be used in mixing the concrete.

The following mixture is suitable: 1 shovelful of cement, 6 shovelfuls of shingle, and 1 gallon of water. A 6 to 1 mix is quite sufficient; a richer mix is merely wasteful of cement. The shovelfuls should be measured with a No. 3 round-mouth shovel.

If the shingle is very wet, a little less water should be used; that is why it is always wise to make a small trial mix before beginning the moulding. A simple test is to take a handful of wet concrete when mixing is complete, close the hand tightly, and then open it. The mixed concrete should stand up on the palm of the hand in a lump without collapsing and should retain the impression of the fingers. If the ingredients are mixed to this consistency, no trouble will be experienced with blocks collapsing when they are turned out of the mould.

Blocks are turned out of the mould as fast as it can be filled. They must be turned out on to a smooth floor, either wood or concrete, and not touched for 24 hours. They can then be stacked and should be left to cure for about 3 weeks. The concrete must be well tamped in the mould and this should be done preferably with a piece of ½in. round iron. It is a mistake to use anything of large section, say, a piece of wood 3in. by 2in., for tamping.

Foundation for Walls

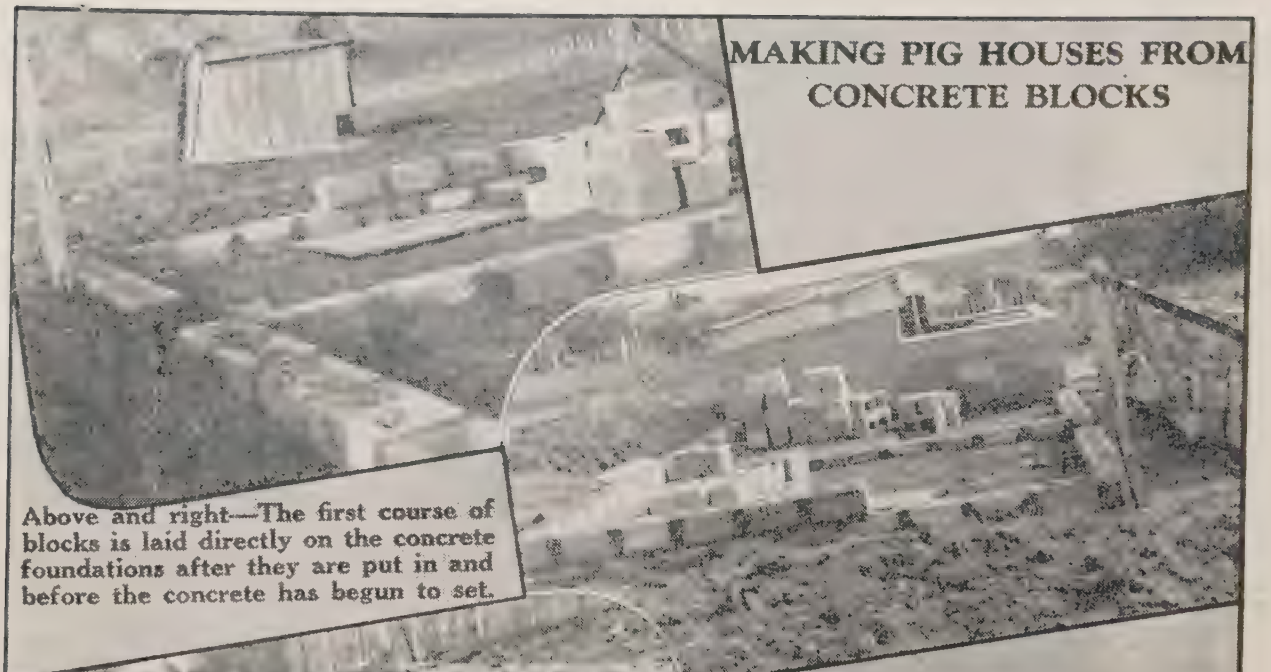
In building piggeries the walls are built first and the floors last. The foundation for walls of blocks must be carefully put down. First the site must be roughly levelled and the ground plan of the building pegged out. Pegs should be placed at the outside corners of walls, and allowance made for the thickness of the wall.

A trench is then dug along the line of each wall for the foundations; it should be at least 6in. deep and slightly wider than the blocks being used.

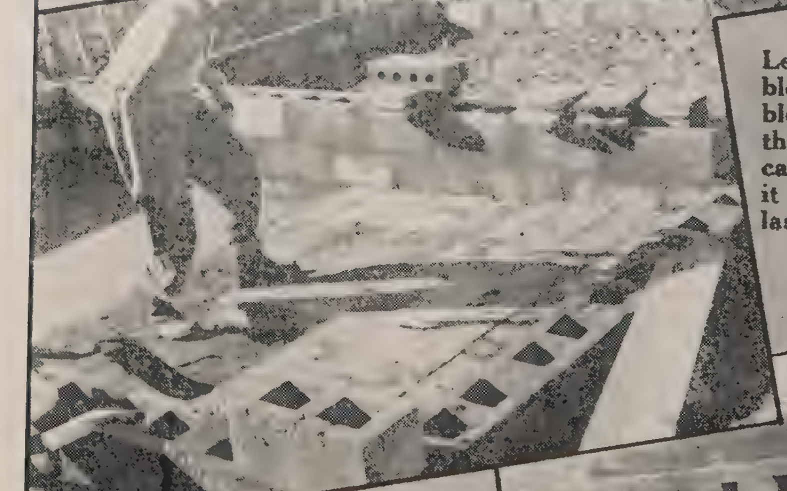
Boards 6in. by 1in. are used as forms in the trench and must be spaced according to the width of block being used and must be held firmly in position with pegs. It is most important to have the boards level both ways, along the length of the wall and across it. When the forms are in place satisfactorily the space between them is filled with a good 6 to 1 mix of concrete and a short piece of timber is used to level the concrete off between the forms.

The first course or layer of blocks can be laid directly on the concrete foundation while it is still wet and this is probably the best way of laying it. Only one course should be laid on the wet foundations. After 24 hours the building of the rest of the wall can be continued if desired.

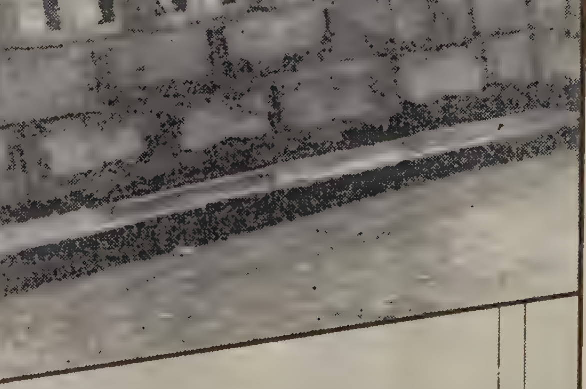
MAKING PIG HOUSES FROM CONCRETE BLOCKS



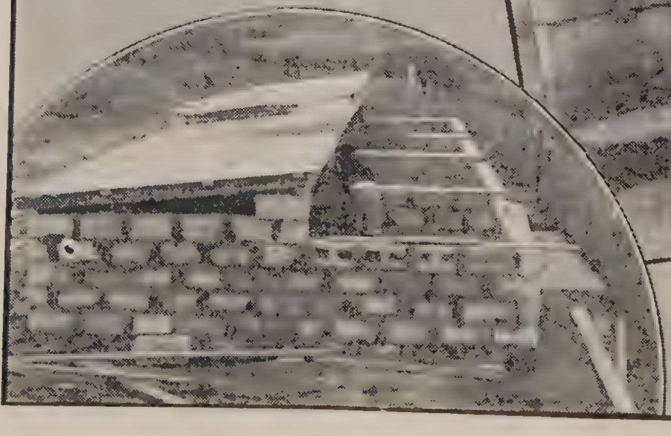
Above and right—The first course of blocks is laid directly on the concrete foundations after they are put in and before the concrete has begun to set.



Left—The walls after three courses of blocks have been laid. Note how the blocks are bonded at the corners of the building. Below—Instead of capping the wall with cement plaster, it can be sealed by laying the last course of blocks on their sides.



Below—The last stages of construction work on a four-unit house.



It is better when building a house containing a number of units to build unit by unit instead of putting up the whole of the back wall and then the dividing walls. If a house is constructed unit by unit, the dividing walls can be keyed into the back wall and will thus strengthen the whole building.

Method of Laying Blocks

The method of laying the hollow blocks in building the wall is exactly the same as that of laying bricks; that is, the joint between two blocks comes over the centre of the block in the course below. As the blocks are much bigger than bricks, each block can be laid true with a spirit level both ways, that is, level and perpendicular. The use of a spirit level is essential to ensure a good job.

The mortar used to join the blocks is nearly always a straight cement mortar consisting of 3 parts of sand and 1 part of cement, which makes a very strong joint. If it is desired to use a lime mortar, the mixture is 1 part of hydraulic lime, 5 parts of sand, and 1 part of cement. The lime and sand are mixed with the necessary water and this mixture can be kept for several days; in fact, it is improved by being kept 2 days before use. The cement is added immediately before the mixture is used.

Any type of piggery can be built of blocks. The whole building may be constructed of them or the block walls can be used for only the first 3ft. and the rest built of timber or some other material such as asbestos board or a timber framing. This depends entirely on the materials available locally.

When the wall has been built to its full height it has to be capped with concrete to prevent water, rats, and mice from gaining entry to the hollows in the walls. During building care must be taken not to fill the air spaces in the blocks, as these spaces are of importance in keeping the building dry and warm.

When a plate is to be fixed to the top of the wall, either to carry roof members or on which to erect further construction work, it is essential that the capping be made quite flat. An easy method of doing this is to put the number of blocks required for the top course on a board, a 9in. by 1in. board is satisfactory, and fill the hollows in them to a depth of about 1in. with concrete. Next day these blocks can be laid in the usual way with the sealed side uppermost.

Fixing the Plate

To fix the plate, which is usually a piece of timber 4in. by 2in., to the wall either bolts or No. 8 galvanised wire can be used. The bolts or wire are embedded in the cement joining the blocks together. The use of wire is the easier way, as the wire is fastened to the plate with staples, whereas bolts require holes to be drilled in the plate, a job that has to be done accurately. A damp course consisting of a strip of roofing felt must be placed underneath the plate.

After the walls have been built with blocks up to the roof allowance has to be made for the slope of the roof. The slope depends on the span of the roof and the fall desired. If the span is 8ft., a half block can be placed on top of the last course in the front if the fall is to the back, and a 4in. by 2in. board placed with one end on this block and the other on the end of the wall at the back of the house. This will give a fall of 9in. in 8ft. The triangular space between the 4in. by 2in. board and the top of the wall can be filled in either with concrete or timber.

If a steeper fall is wanted or the span of the roof is greater, as it is in the type of house in which the whole floor area is roofed over, the walls are taken up in steps, using shorter and shorter courses of blocks, toward the highest point of the roof. A piece of timber is then fixed in the manner described and the spaces filled in. The use of wire is by far the best way of fixing these plates to carry the roof.

The reinforcing of block walls at doorways, gates, and corners is worth while and is done quite easily by placing a piece of ¾in. or 1in. piping or a steel fence dropper in the last cavity of the wall and filling the cavity with concrete. This piece of reinforcing goes from the top to the bottom of the wall and should preferably be set in the foundations. When this is done the last block in each course is slid down the reinforcing rod and the cavity filled with concrete as building proceeds.

If the wall is more than 4ft. high, piping is the most satisfactory material to use, as it can be joined in the middle of the wall and thus eliminates much lifting of blocks.

Hinges for doors and gateways can be set directly in the wall by being embedded in the cement joining the blocks, but it is better in the long run to set bolts in the wall and attach a piece of 4in. by 4in. timber on to which the hinges can be fixed. This makes renewal of the hinges easier.

Though plans of piggeries have not been dealt with in this article, plans of different types of piggeries are available from the Department of Agriculture at a cost of 5s. each. However, it is advisable for farmers to discuss the matter with the supervisor of their district pig council before sending to the Department for plans. District pig councils have copies of these plans and supervisors can give advice on the type of piggery most suited to specific requirements and the best location for it.

The addresses of the district pig councils are as follows:—

Northland: Box 131, Whangarei.
Auckland: Box 43, Pukekohe.
Waikato: Box 458, Hamilton.
Bay of Plenty: Box 79, Whakatane.
Tairawhiti: Box 316, Gisborne.
Wellington: Box 80, Palmerston North.
Canterbury: Box 639, Christchurch.
Otago and Southland: Box 693, Dunedin.

Dalefield Factory's Success at London Dairy Show

[Photo News Ltd. photo.

AFTER a lapse of 10 years the British Dairy Farmers' Association dairy show was revived last October when the association staged its 62nd exhibition in London. The show has for many years been of particular interest to those cheese-manufacturing factories in New Zealand which have exhibited regularly in the class for Cheddar cheese produced in the British Empire (overseas), as this class includes a competition for the Bledisloe Cup, a perpetual challenge trophy awarded to the provincial area of New Zealand exhibiting the best cheese.

The Wairarapa district, through the Dalefield Co-operative Dairy Company, won the cup—one of the two trophies presented for competition in the class by Viscount Bledisloe during his term as Governor-General. It marked the first success of a North Island factory, Southland and Otago having previously provided the winners. It is expected that South Island factories will redouble their efforts in an attempt to regain the trophy at this year's show and competition among North and South Island factories is expected to be very keen.

QUALITY IN DRAIN TILES

By A. J. GALPIN, Fields Instructor, Department of Agriculture, Palmerston North.

THERE appears to be a considerable difference of opinion among manufacturers and farmers as to what constitutes good quality in field drainage tiles. One of the requirements often stated to be essential is porosity or the capacity for water to pass through the walls of the tiles and so into the drain. However, in New Zealand, where field tiles are usually loosely butted in the drains, porosity is of little importance, as drainage water can gain access to the tiles much more readily through the gaps between the ends of tiles. This is the case even when the tiles are butted as closely as possible. Even if tiles are porous when first placed in the ground, porosity is soon lost in many soils through the formation of an impervious skin on the outside of the tiles. Actually with the usual short, 12in. field tiles loosely butted in the drain porosity of tile walls is of no real importance. Undoubtedly the quality which is of real importance in field tiles is strength.

TILES must be sound and strong to stand the handling from the manufacturer to the farm and during laying operations and to resist the pressure of the soil used to cover them. In the case of burnt-clay tiles strength is secured by proper and thorough kiln burning. The quality of the clay used is also of considerable importance.

Properly-burnt clay tiles are generally much more porous than badly- or partly-burnt tiles, which may have given rise to the belief that it is essential for tiles to be porous. Indications of good burning are a brick-red colour and a clear ring when the tile is tapped, but the practical test is the pressure which can be put on the side of the tile with the foot before the tile breaks. It should be possible to stand on a good, sound tile, or give it a good hard stamp with the heel without breaking it.

With concrete tiles, the manufacture of which is developing rapidly in some districts, the position is somewhat different. In concrete tiles the aim should be strength and density and porosity should be avoided, as it is unnecessary and strength must be sacrificed to achieve it. The two most important points in the manufacture of good-quality concrete tiles are the composition of the aggregate and the correct proportions of cement and water in the mix together with the efficiency of the machine in compacting the material when forming the tile. In discussing these points an American publication, "Agricultural Engineering," makes the following statement:—

> The proper proportions of clean fine aggregate, cement, and water do not ensure high strength of the concrete tiles. This combination of materials must be thoroughly compacted when formed into the drain tile. Too often not enough thought is given by manufacturers to the proper care of the machine that packs the concrete in the mould. Frequent replacements with new or rebuilt shoes is necessary on the packer head. Tests have shown that a good concrete mix poorly tamped may give strength tests as low as 500lb. per linear foot of tile and absorptions as high as 15 per cent., when the same materials properly tamped may yield tile strength of 3500lb. per linear foot with absorptions as low as 3.5 per cent.

This statement indicates that porosity is gained at the expense of the strength which is the essential requirement of flat-ended tiles. Manufacturers should not give any consideration to porosity in concrete tiles, but should aim for strength. Farmers can test concrete tiles by seeing if they withstand the pressure of the foot on the sides of the tiles.

An astute salesman can appear to demonstrate soundness and strength in field tiles by throwing them about, but always in such a way that they land safely.

Another important point with concrete tiles is that the acidity of certain soil waters, if the water passes through the body of the tile, may cause the lime to be removed from the cement, with the resultant collapse of the tile. For this reason alone the tile should be impervious to water.

More Water in Mix

Concrete tiles are being made with a rather dry mix so that the moulds can be removed immediately the tiles are formed and the tiles can be stood on end. Because of the need for strength and density in concrete tiles, it is considered that more water should be added than is commonly done in the mix and that for the smaller sizes of tiles special facilities for curing should be provided. It is particularly important that concrete drain tiles be well cured before use.

Due in the main to some confusion as to what constitutes good quality in field tiles, the standard of both clay and concrete tiles being manufactured is often far from satisfactory. Strength and soundness are the main requirements and the farmer's best test of quality is the amount of pressure which tiles will stand before breaking.

DAIRY PRODUCE GRADED FOR EXPORT

THE following figures showing quantities of dairy produce graded for export during May and for the 10 months ended May 31, 1949, with comparative figures for the same month and 10-monthly period of last year, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER—

Period	Creamery (Tons)	Whey (Tons)	Total (Tons)	Percentage Inc. or dec.	Total in store at end of mth. (Tons)
May, 1949	4,079	122	4,201	+56.054	25,193
May, 1948	2,618	74	2,692	—	26,074
Increase or decrease	+1,461	+48	+1,509	—	—881
For 10 months ended 31/5/49	141,129	2,605	143,734	+10.494	—
For 10 months ended 31/5/48	127,763	2,319	130,082	—	—
Increase or decrease	+13,366	+286	+13,652	—	—

CHEESE—

Period	White (Tons)	Coloured (Tons)	Total (Tons)	Percentage Inc. or dec.	Total in store at end of mth. (Tons)
May, 1949	5,108	300	5,408	+58.918	16,712
May, 1948	3,403	—	3,403	—	7,420
Increase or decrease	+1,705	+300	+2,005	—	+9,292
For 10 months ended 31/5/49	88,092	5,053	93,145	+14.124	—
For 10 months ended 31/5/48	81,617	—	81,617	—	—
Increase or decrease	+6,475	+5,053	+11,528	—	—

If these figures are converted into butterfat equivalent, there is an increase of 11.307 per cent. in butterfat graded for the 10 months as compared with the corresponding period of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

FEEDING OF SHEEP

Valuable information on the winter feeding of ewes, the summer fattening of lambs, and the winter feeding of hoggets in Canterbury, which was obtained in the course of investigations begun at Kirwee Experimental Farm in 1940, is embodied in the Department of Agriculture's Bulletin No. 320, "Feeding Experiments of Ewes, Lambs, and Hoggets in Canterbury," which may be obtained free from the nearest office of the Department.

Garden Sowings should not be Extensive in August

By A. G. KENNELLY, Vegetable
Instructor, Department of
Agriculture, Christchurch.

IN most districts August is regarded as the beginning of the garden year and there is therefore a tendency among home gardeners to make immediate and often quite extensive sowings of hardy vegetables regardless of ground conditions. In most districts, however, sowings should be small and confined to early, quick-maturing varieties.

[*Green and Hahn Ltd. photo.*

Green crops should be dug in sufficiently early to permit them to rot down before other planting or sowing is undertaken.

GROUND conditions, particularly where the soil is heavy or moderately heavy, are rarely consistently good throughout New Zealand in August, and if there is a cold, wet spell after sowing, there may be gaps in the crop or even complete failure.

A simple method of testing the condition of the soil for sowing after the soil has been dug over and where there is a doubt as to whether it is too wet is to walk on it. Soil is usually in the right condition if it does not stick to the soles of the boots when walked on. That is a good test for most soils. Soil condition, provided there is sufficient moisture, is less important for planting, though results are always better where the soil is in the right condition. If the soil is on the wet side, however, it is always better to work from a board laid on the ground than to walk on the surface of the soil when sowing or planting.

Small sowings of most hardy vegetables can now be sown in well-drained soil in favourably-situated gardens. Beetroot, carrots, Chinese cabbage, cauliflower, summer cabbage, lettuce, turnips, radish, peas, salsify, scorzonera, spinach, silver beet, and parsley, together with many other herbs, can be sown. Lettuce, silver beet and perpetual or spinach beet, early cabbage, cauliflower, and onions can be set out in most districts and should mature quickly if strong, well-rooted seedlings are set out in well-manured soil.

Digging in Green Manure Crops

In most well-planned gardens there should now be considerable areas that were dug over earlier and either sown in cover crops or left rough to be exposed to the weather. Green crops should be dug in without delay, as they require time to rot down before the area is planted or sown.

Though the time required for a green crop to rot down depends on many factors such as its bulk, its stage of growth (whether woody or sappy), the condition of the soil (whether it is well aerated and contains sufficient lime), the extent to which the green crop is mixed with the soil, and the amount of moisture present, in general the average well-grown green crop which is fairly bulky should be given at least 6 weeks to rot down. If plants are sown or set out before the green crop has rotted properly, they may be checked severely due to nitrogen starvation. For that reason sulphate of ammonia is sometimes applied at the rate of about 1oz. per square yard when digging in a green crop.

A check to the growth of crop plants is less likely where the green crop is soft and sappy and particularly where legumes such as lupins are grown, as legumes, if left long enough to become well established, develop nodules on their roots. The nodules are caused by nitrogen-fixing bacteria which live in partnership (symbiosis) with the leguminous plants; each nodule is the home of millions of bacteria, which enter the roots from the soil. The plant supplies the sugar and in return the bacteria supply nitrogen in the form of compounds which the plants can use. The nitrogen becomes available as rotting proceeds and serves to supplement existing supplies. Because of the extra nitrogen available crop plants are less likely to suffer nitrogen starvation due to the high demands for nitrogen of the soil bacteria in their work of breaking down the cellulose.

Asparagus

Though in parts of the South Island, particularly where soil conditions are cold and wet, September is preferred for setting out plants to establish a new bed of asparagus, in most northern districts ground conditions are favourable in August and the plants or crowns to be set out are in the most suitable condition then. One-year seedlings are usually preferred, as they transplant better and establish more readily than 2-year crowns, which are considerably larger and therefore more subject to damage during transplanting. Crowns can be set out about 8in. below soil level and the roots spread evenly over a small mound drawn up in the bottom of the trench.

The top bud should not at first be covered with more than 2in. of soil, as the young plants are liable to be smothered and retarded if deeply covered before they have become established and are sufficiently strengthened. The crowns should be placed about 18in. apart in either single or double rows, but the bed for the double row should not be more than about 42in. wide.

The period during which asparagus can be cut varies greatly according to the bed and may range from about 6 weeks to about 10 weeks. The productiveness of the bed will be greatly curtailed by too-early cutting. Only if the growing season is long and the plants well established should a cutting of not more than 2 weeks be made the third year from time of planting the seed (the second year after setting out); in the fourth year the cutting period should not exceed about half the season or about 4 weeks. Thereafter cutting can continue each year for from 6 to 10 weeks according to season of growth and vigour of the bed.

THE HOME GARDEN IN AUGUST . . .

Built-up or raised beds are an advantage where the soil is shallow or the drainage poor. Good drainage is essential, and the site on which it is intended to establish a bed should first be dug deeply. All perennial weeds should be removed and where it is obtainable a good dressing of organic manure such as farmyard or stable manure or compost applied. A complete fertiliser (one containing nitrogen, phosphoric acid, and potash) is also advisable on most well-worked home garden soils. It should be applied at up to about 4 to 5oz. per square yard.

Popular varieties are Mary Washington, Martha Washington, Connover's Colossal, and Paradise, a variety of more recent origin. Martha Washington is not generally considered as fine a variety as Mary Washington. It is, however, highly resistant to the fungus disease rust and because of that is highly valued overseas where rust is troublesome.

Rust disease (*Puccinia asparagi*) has not yet been recorded in New Zealand, though rusty markings on young stems and shoots are occasionally reported. Its distinguishing feature is the production of very great quantities of rusty-brown powder on the bower or fronds in late summer and of black streaks on stems and needles in autumn. The fronds usually die prematurely and thus check plant growth and the following season's spear production severely. Gardeners who notice symptoms similar to those described should report the matter at once to the local Instructor of the Horticulture Division.

Garlic

It is usual to grow garlic from cloves (the divisions of the bulbous root) planted in July or August about 2in. or a little more than their own depth below the surface of the soil and 6in. apart in rows 12in. apart, though it may be advisable to plant them earlier where their keeping quality is in doubt. They can be pressed into the ground or planted in a drill.

If whole bulbs are planted, they should merely be pressed to half their depth into the soil. The soil must be well drained or the bulbs may rot. The plant can also be grown from seed sown any time in spring. Apart from weed control, cultivation is unnecessary.

Garlic is pungent and is unexcelled for using in sauces and pickles and for flavouring. The colder the conditions under which it is grown the more biting or burning is its flavour.

Bulbs of the common variety have a membranous skin of silvery white, though there are pink and red varieties in addition to a very large variety having leaves somewhat like a leek. Culture in general is similar to that of the onion.

Globe Artichoke

Globe artichokes are hardy on well-drained soils in most parts of New Zealand, as the vegetative parts can withstand several degrees of frost and the roots even more severe temperatures, but in districts where winters are very cold plants should be lightly earthed up during prolonged, cold, wet periods. They succeed best in districts where the winters are moist and mild, even though fairly cool, as under such conditions the edible bracts, which enclose the flower head tightly, develop well, though flower development is slow. Where winters are very cold and conditions severe bud development is late, and if temperatures are high in summer, the edible stage quickly passes, as the floral organs develop quickly, and the succulence and tenderness of the edible parts are soon gone.

[*Green and Hahn Ltd. photo.*

Asparagus beds can now be laid down in most districts and as good, well-tended beds may yield good crops for up to about 20 years, initial soil preparation should be thorough and the plants should be set out with care.

Artichokes grown from seed of an unknown stock are sometimes disappointing, but a good stock can be perpetuated if the plants are grown from suckers, though plants from suckers rarely thrive as well as plants grown from seed, especially in a dry season. Suckers should be planted firmly and deeply when about 9in. high; this is usually in October.

Edible flower heads can be produced the first year from seed sown under glass in August if cultural conditions are good. Alternatively seed can be sown in September or October in drills 12in. apart and the plants later thinned to 8in. apart. Early the following season the plants should be set out in their flowering positions 30in. apart in rows 4ft. apart.

The preferred soil is rich and deeply cultivated, though the plants will grow and produce flower heads in almost any well-drained soil that is not permitted to dry out. In late autumn the stalks should be cut to within about 1ft. of the ground, and if the plantation is to remain, it should receive a liberal dressing of organic manure.

A plantation of artichokes may last up to about 5 years in rich soil, but on poorer soil results are likely to be disappointing after 2 years. Each year after establishment plants should have all but 4 of the strongest suckers removed and to obtain big flower heads lateral buds surrounding the main head should be removed when about the size of a hen's egg.

The main objection many home gardeners have to globe artichokes is the large amount of space they occupy in relation to their yield. They are, however, rather ornamental and a few plants would help to provide variety in gardens having the space.

Buds may be prepared for the table in a number of ways; the small side buds may be eaten raw or fried, but the main bud is usually boiled, and the fleshy inner and outer bracts or floral leaves are eaten rather after the manner of asparagus.

The globe artichoke is the only true artichoke. It is occasionally known as the burr or french artichoke. In countries overseas where globe artichokes are more commonly grown than in New Zealand there are two important varieties, Purple Globe and Green Globe, as well as strains of less importance, but few seedsmen in New Zealand carry stocks of different varieties.

Jerusalem Artichoke

The Jerusalem artichoke belongs to the same family as the sunflower, and its relationship to the sunflower seems apparent from even superficial comparison of its leaves and habit of growth with those of the sunflower.

[*Green and Hahn Ltd. photos.*

The globe artichoke is the only true artichoke. It is quite a decorative plant, but in the vegetable garden it is grown for the huge, immature flower buds, the scales of which are edible. Though the taste is acquired, the vegetable is highly prized by connoisseurs. Left—Edible bracts. Right—A flower head in flower.

Jerusalem artichokes are so hardy and easily grown that they deserve a trial in all home gardens where there is sufficient space and where their flavour and the variety they add to the menu are likely to be appreciated.

They need an open situation, but do not require special soil, though they yield better-quality tubers and heavier crops in good, moderately-rich soil where there is adequate moisture. They are not usually troubled by pests or diseases and are easily propagated by planting the tubers which may be either cut or whole. Small complete tubers are usually chosen; if the tubers are cut, each section should have one or more eyes.

Tubers are usually planted 3 to 5in. deep (shallow in heavy soil and deep in light soil) and 12 to 18in. apart in rows 3ft. apart. To obtain full advantage of the sun rows should run north to south. In rich soil they may grow 8 to 10ft. high, and though they afford good shelter, particularly where a double row is planted, care should be taken not to plant them where they will overshadow other crops.

As they are very hardy and keep well if left in the ground, they can be dug as required during autumn and winter, but should be lifted and stored in a cool place in August or they will recommence growth. They should be dug with a fork and every piece removed; pieces left are likely to interfere with the growth of succeeding crops.

Heavy yields can be expected where conditions are favourable, but in most districts digging should not be commenced until late in the season when the stems have nearly ceased growing, as the tubers form late.

The flavour of good varieties is sweet and rather watery and the nutritive value of the tubers about the same as that of the potato, though they require a different method of cooking. The tubers are somewhat like potato tubers, though the common varieties are much more knobby. In New Zealand distinct varieties of Jerusalem artichoke are not usually listed by seedsmen; tubers are offered simply as Jerusalem artichoke, but varieties such as Jerusalem Potato Artichoke and Improved Yellow, White, or Purple are obtainable overseas.

Onions

The production of main-crop onions from autumn-sown seed is confined mainly to the North Island, and where the ground is in suitable condition plants should be set out without delay. The ground for the onion bed should preferably have been prepared some time in advance by deep digging and liberal manuring with organic manure. A complete fertiliser containing a high percentage of bonedust (which contains slowly-available phosphoric acid and a little nitrogen) has given good results on a wide range of soils and can be applied at the rate of about 3 to 5oz. per square yard.

As the onion is very sensitive to excessive soil acidity, lime may be necessary. An annual dressing of about 2 to 4oz. per square yard should give satisfactory results in most districts. It could be reduced in districts where rainfall is low.

Plants can be set out 3 to 6in. apart in rows 12 to 15in. apart. Varieties include early-maturing, giant, and long-keeping types and in the planned garden where the flavour of onions is appreciated some of each kind should be planted.

Peas

Where the soil is well drained and the aspect favourable, peas can be sown now even in southern districts. Nothing is to be gained, however, and the crop may be disappointing if seed is sown in cold, wet ground. It is not unusual for crops sown several weeks later in favourable conditions to mature earlier than crops sown under unfavourable conditions. Because the length of time in which most varieties of peas can be harvested is very limited, it is advisable where peas are appreciated to make a number of sowings.

Peas do well in cool conditions and prefer a moist, well-drained soil rich in humus. They repay good cultural methods and the ground should be deeply dug and manured, preferably in the autumn, with organic material

[*Green and Hahn Ltd. photo.*

The top growth of the Jerusalem artichoke is rather like that of a large sunflower. The plant is easy to grow and high yielding where conditions are favourable. Tubers can be planted now.

such as stack bottom, compost, or farmyard manure. Dwarf varieties such as W. F. Massey can be grown without staking, but the rows should be kept earthed up. If, however, short sticks or suitable twiggy material is available, they should be staked as well, because the plants are usually better if given support.

Most varieties of peas can be harvested only for a comparatively short time, and to obtain a succession it is usually advisable to make successive sowings at intervals of about 3 to 4 weeks of varieties having nearly similar maturity periods or to sow at about the same time several varieties each of which will mature its crop in succession.

Seed should be sown 1 to 2in. apart in V-shaped or broad, flat drills, which can be drawn out with a hoe 18 to 30in. apart according to variety. Drills should be 2 to 3in. deep except where conditions are hot and dry, when they should be considerably deeper, so that though the seed should not be covered by more than 1½ to 2in. of soil, the roots will be well down in the cooler and moister soil of the lower levels.

Perennial Crops from Seed

If the soil is well drained and works freely and the situation is sufficiently favourable, perennial plants such as asparagus and rhubarb can be sown now. Soil and climatic conditions should, however, be favourable or sowing should be deferred until September or October.

Asparagus

Asparagus seed should be sown ½ to 1in. deep (according to whether the soil is heavy or light) in rows 18 to 24in. apart in soil that has been deeply and thoroughly cultivated. Though asparagus is one of the few vegetables that can be grown successfully in a soil that contains very little humus but has sufficient plant nutrient, a better type of seedling usually results if the seed-bed has been dressed some time before sowing with a moderate quantity of well-rotted organic manure or with compost.

Seed should be sown thinly; about 6 to 8 seed per foot of row is usually satisfactory. If sown too thickly, the roots become entangled and the plants do not grow as well as well-spaced plants. Even if seed is sown as thinly as advised above, thinning is usually necessary where germination is good, because the plants are usually left in the nursery rows for at least a year before being set out in their permanent positions, and if they make good growth, spacing of about 4in. apart in the nursery rows is desirable. If seed is sown in early spring when the ground is cold, it may take about 4 to 6 weeks to germinate, though in late spring or early summer only 2 to 3 weeks is usually required.

Prompt and efficient weed control is very important, and in the home garden if seed of quick-maturing varieties of radish or turnip is sown with the asparagus, it will serve to mark the rows. The turnip or radish crop should, however, be removed if its growth appears likely to check the asparagus. .

Male plants yield more heavily than female plants, as much of the energy of the female plants is diverted to seed production. However, it is not practicable to sort the male from the female plants, as it is necessary in most parts of New Zealand to hold plants in the seed-bed for 2 or 3 years before sorting can be done; the delay and check to growth entailed in planting crowns 2 to 3 years old as against 1-year-old crowns nullify the advantage of setting out a bed consisting mainly of male plants. Furthermore, the claim that crowns that are 2 or more years old when set in their permanent position give heavier yields in the early harvest years than 1-year-old crowns is not borne out by experience.

Rhubarb

Though most home gardeners prefer to establish new rhubarb beds with crowns brought in from outside sources or by the division of crowns grown in their own gardens, rhubarb can easily be grown from seed sown in spring 1in. deep in rows 15in. apart in fertile, well-drained soil. Seedlings should be thinned to about 6in. apart as soon as they are properly established. Young plants can be set out in

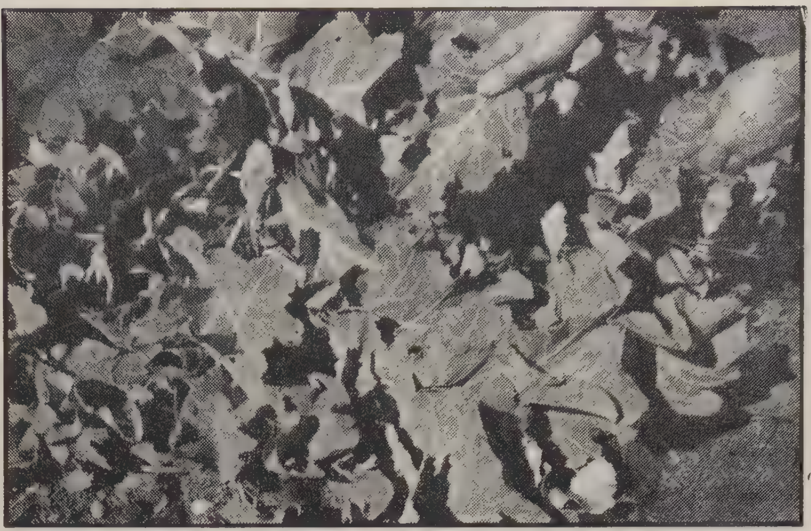
[*Green and Hahn Ltd. photo.*

Garlic is grown for its pungent flavour and it is said to have antiseptic properties. The plant is usually propagated from the cloves or divisions of the bulb, though culture otherwise is in general similar to that of the onion.

their permanent positions early the following spring.

In general few if any stalks should be pulled until after the second year of establishment, though the home gardener should be guided by the condition of his plants. A moderate amount of earlier pulling may not harm the plants if they are large, well established, and vigorous and the soil is moist, rich, and fertile.

Generally it is rarely possible to recommend seed of a particular variety of rhubarb, as plants raised from seed are usually extremely variable in their characteristics and in the quality and flavour of their stalks. Though the simplest method of starting a new bed is to plant suitably-sized crowns (usually with one or two buds on each) from a stock of proved performance, it is advisable to select suitable plants according to their vigour, colour, size of leaf stalk or petiole, and period of bearing if plants are to be raised from seed.



[*Green and Hahn Ltd. photo.*

Sea kale is not one of the common vegetables in New Zealand home gardens, but it is easy to grow and its blanched shoots are preferred by many to asparagus.

Potatoes

In most districts it is not advisable to plant any considerable area of potatoes until September and in many districts it is best to wait until October. Well-sprouted tubers that are not planted deeply soon send shoots up to the surface, and unless the home gardener is prepared to keep them earthed up, they may be cut down by frost. Destruction of the tops by frost rarely kills the plants, but it delays their maturity and usually, particularly with early plants, reduces the yield.

The cold soil conditions engendered by frost also render the plants more susceptible to the attack of the fungus disease *Corticium solani* (also known as *Rhizoctonia* canker or black scurf), which frequently causes "missing" in the potato rows by attacking and destroying the young shoots as they emerge from the tuber.

The same fungus may also attack the base of potato stems and cause a dry canker which in turn may cause the stems to thicken or the upper leaves to roll slightly and in some varieties to take on a purplish tinge; in some cases tubers form in the junctions of the branches and the tubers in the soil may develop only near the surface of the soil and be rather misshapen.

Though it is too early in most home gardens to begin planting the main crop, it is a good plan to sort over stored tubers; those selected for planting should be set in boxes in a light, airy, frost-free shed or outhouse to green and sprout.

Potatoes require a well-drained soil containing adequate well-rotted organic manure. They are tolerant of acid conditions and lime is rarely advisable. Sets (either cut or whole) should be planted 3 to 4in. deep and about 10 to 16in. apart in rows 24 to 27in. apart. Plants that are to be dug early or tubers that are set out very late can be planted about 10 to 12in. apart in the rows.

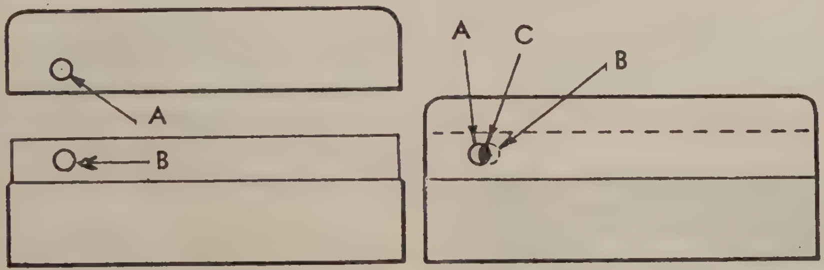
Though certain varieties are especially suited to certain districts, the following have found wide favour for early cropping: Epicure, Jersey Bennes, Arran Banner, Doon Early, Sharps Express, and Eclipse.

Sea Kale

Sea kale has a delicious flavour which is preferred by many to asparagus. Though it is not grown in many home gardens in New Zealand, it deserves more general culture, particularly where its flavour is appreciated and there is ample space for it. It can be forced quite simply and though the method adopted in Europe of lifting the crowns, potting them, and forcing them in a heated glasshouse would not be practicable in many New Zealand home gardens, equally good results, though not such early crops, can be obtained by simply covering the plants in the open as soon as they commence growth in spring.

Plants may be covered in succession from June until about August, though in districts which experience a very mild winter early covering is best. Plants covered at the beginning of August, particularly in southern districts, produce good blanched shoots. To produce a delicate sample, sea kale may be covered with partly-rotted leaves or strawy litter or with boxes

HOME-MADE SEED SOWER



Home gardeners who experience difficulty in sowing seed evenly will find a tin with holes drilled in it as shown above a great help. By sliding the lid around, the hole can be adjusted to allow different-sized seeds to pass through or to drop seed at different rates. A tobacco, polish, or similar type of tin is suitable. The size of the hole made is limited only by the depth of the flange on which the lid is pressed. Usually only a small hole is required, as large seed can be handled and sown without difficulty. Two or more sets of holes can be made if desired, but their edges must be smooth to enable the seed to fall out easily and the lid to slide around. If more than one set of holes is drilled in the tin, care must be taken to ensure that seed can come out only one set at a time. Left: Tin with lid raised. A—Hole in lid. B—Hole in flange. Right: A—Hole in lid. B—Hole in flange. C—Aperture through which the seed falls.

or pots from which the light is excluded by covering them with sacking or strawy litter. Alternatively they may be covered by simply drawing up the earth against the sides where they touch the ground and where light may penetrate.

Sea kale is usually rather bitter if grown in light and in this respect it differs from rhubarb, which can be forced in a somewhat similar manner. In districts which experience a very mild winter it is sometimes difficult to produce a fine-flavoured sample because if the temperature exceeds 55 to 60 degrees F. for any considerable time, the shoots usually become thin and wiry.

The covering should be removed from to time to observe growth and when the shoots are ready they should be cut together with a small portion of the crown. When all the growth is taken the box should be removed and the crown covered for protection with a thin layer of fine soil or soil mixed with compost. Flower stems must be removed and only two or three of the strongest shoots left, but if the soil is rich and well manured and adequate moisture is maintained, a sea kale bed will last for years.

The usual method of starting a sea kale bed is to buy well-grown roots, which are stocked by many good seedsmen, and plant them 18in. apart in rows 2ft. apart in richly-manured, deeply-dug soil in July or August or in some southern districts in September. Roots, however, may be planted in autumn or winter if the soil is well drained and the situation favourable. To prevent flowering, the pointed buds on the crown of each root should be cut off before planting. If the buds are not cut off, flower stems usually develop and must be removed.

Sea kale can also be grown from seed sown in drills 12in. apart in September or October; seedlings should be thinned early to 6in. apart and the plants set out in their permanent positions in August or September, or if the situation is favourable, during late autumn or winter.

Shallots

In the home garden shallots are mainly grown for pickling or flavouring. They are easily grown and prefer a well-drained soil in a sunny situation. Except that the shallot is commonly increased by offsets or cloves and can usually be set out earlier, its culture and harvesting are in general similar to those of the onion. Heavy, cold soils should be avoided.

If planted early enough, small bulbs give just as good results as large ones. Early planting is desirable, too, as the bulbs or cloves of some varieties commence to soften and may fail if planting is delayed too long. May is therefore often preferred, though the common rule for the culture of shallots is to plant on the shortest day and to harvest on the longest.

The shallot is a particularly hardy vegetable, and because it is planted out as a small bulb, it is better adapted to stand rigorous conditions than plants of closely-allied families which are grown from seed, but planting on the shortest day is of little advantage if soil and climatic conditions are unfavourable. Bulbs should be graded to size and planted 5 to 8in. apart in rows 12in. apart; each bulb can be pressed firmly just sufficiently far into the soil to keep it in position, though some growers prefer deeper planting and set bulbs to half or three-quarters of their depth. If set deeply, the earth should be drawn away from the bulbs as they mature. All flower heads should also be removed during growth.

There are two main varieties, the true shallot and the Jersey or false shallot. The true shallot usually develops a bulb about as large or a little larger than a walnut and is pear-shaped and narrowed on the upper part to a rather long point. The outer skin is thick and tough, is often wrinkled lengthwise, and is russet to coppery red in the lower part. The leaves are 9 to 12in. long, small, and very green. Some strains are very long keeping.

The Jersey shallot has short bulbs, which are often irregular, though sometimes perfectly rounded, rather like the potato onion. The skin is coppery red, thin, and easily torn. The underskin is violet and paler than the true shallot. The leaves are greyish green. The bulbs require more space and do not keep as well as the true shallot.

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DEATH OF MR. R. P. CONNELL

THE death occurred suddenly at Hanmer on May 4 of Mr. Richard Patrick Connell, Fields Superintendent, Department of Agriculture, Christchurch. Mr. Connell had devoted his life's work to the improvement of New Zealand farming and was one of the first Instructors in Agriculture appointed by the Department of Agriculture. Previously the Department had relied on men with a practical farm training only for its extension work. Mr. Connell's appointment as Instructor in Agriculture in 1919 marked the initiation of the policy of the appointment of instructors whose training combined science with practice, a policy which has developed so satisfactorily on the basis of the work initiated by the early appointees.

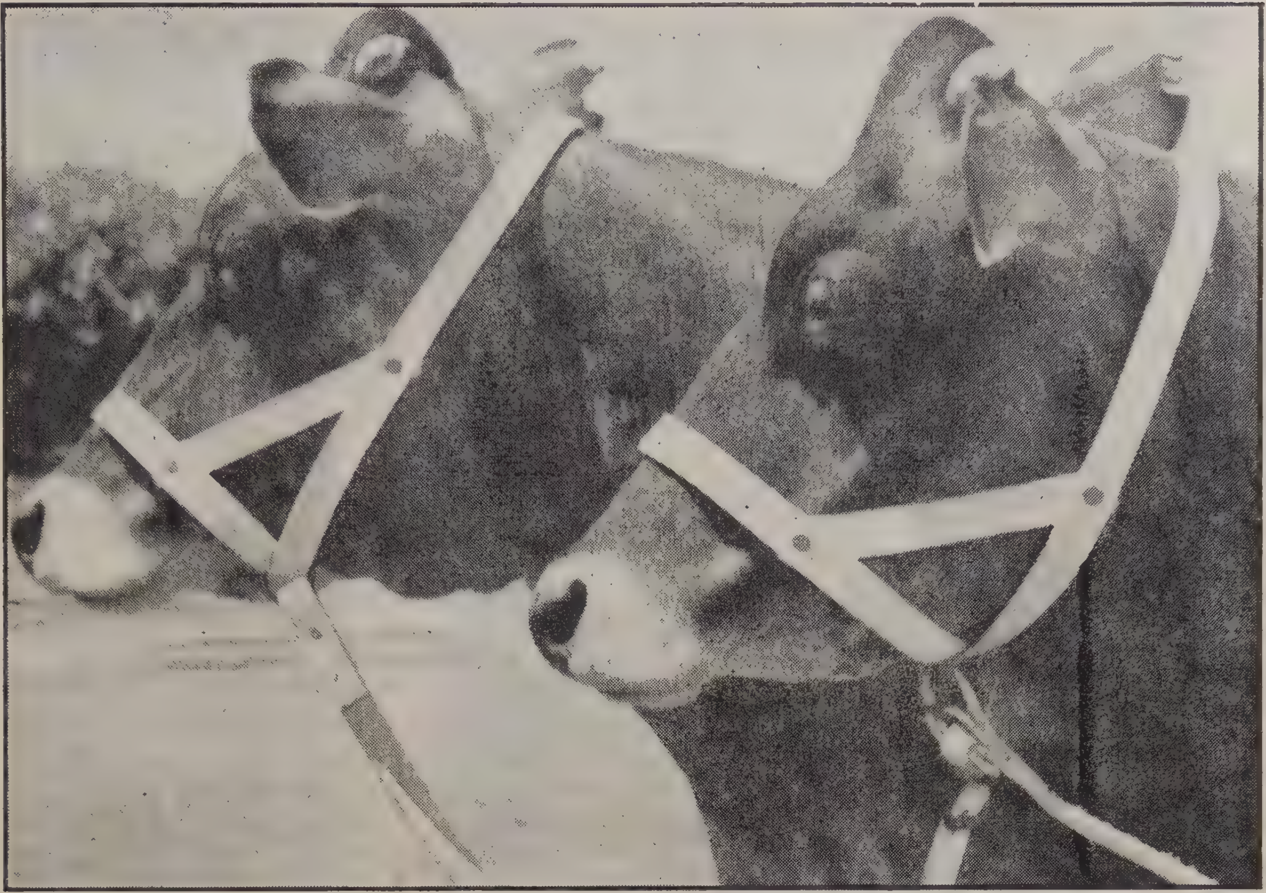
After graduating as a a master of arts Mr. Connell was employed by the Auckland Education Board as an Instructor in Agriculture and transferred to the Department of Agriculture as an Instructor in Agriculture at Dunedin. In 1920 he resigned from the Civil Service and was engaged for 6 years as Associate Editor and Manager of "The Dairyfarmer." He then rejoined the Department as Instructor in Agriculture, Palmerston North, and was appointed Acting Editor of "The Journal of Agriculture" in 1933, Land Utilisation Officer in 1937, and Fields Superintendent, Christchurch, in 1941.

[*"The Press" photo.*

Mr. R. P. Connell.

In all the positions held by Mr. Connell his work was uniformly directed by three major ideas—the importance of intensive grassland farming, the value of farm studies in popularising improved management practices, and the value of the written word in extension work. He was already an advocate of intensive grassland farming in the early 1920's, when its value was not nearly as fully accepted as it is now, and as Associate Editor of "The Dairyfarmer" he was one of the early exponents of the policy of writing up the management practices of successful farms. He continued work on these lines when he returned to the Department as an Instructor in Agriculture, and it was on the basis of this work that he was appointed Land Utilisation Officer and was then enabled to initiate land utilisation studies over a much wider field. His work as secretary of the New Zealand Grassland Association from the inception of the association until his death was of considerable importance both to the development of the association and to the diffusion of knowledge on grass farming. His inclination to literary work and his experience as an editor gave him the ability to impart his knowledge to others in articles and scientific papers, but this attribute did not impair, as it often does, his ability to speak. As a writer and lecturer he was able to bring his influence to bear on a very large section of the farming community.

In the 30-year period between 1919 and 1949 the work of Instructors in Agriculture has had a great influence in promoting better farming in New Zealand, and credit for a very large share of shaping that improvement is due to Mr. Connell. He saw the importance of building research and extension work on the practices of the most successful farmers and he was indefatigable in seeking out those farms which could be used as examples, in directing research to amplify and explain the methods used, and in expounding the useful practices to as large an audience as could be reached by the written and spoken word.—*P.W.S.*



IDENTICAL TWINS NEEDED FOR RESEARCH AT RUAKURA

By J. J. HANCOCK, Research Officer,
Department of Agriculture Animal Research Station, Ruakura.

MANY farm practices have been handed down from one generation to another without having been tested in the light of newer scientific knowledge, and one of the main jobs at the Department of Agriculture Animal Research Station at Ruakura is to find out whether or not the common methods of breeding, feeding, and management are the most efficient possible. Identical twin calves are proving most valuable in this work, and the co-operation of farmers in supplying identical twins to the station is again sought his year.

THE difficulties involved in experimental work with domestic animals are due to two main factors:—

1. The great individual inherited variation which all animals have in their economically-important features. In any herd, for instance, there will be cows which never produce more than 200lb. of butterfat, while in the same herd, eating the same grass, there will probably be cows bettering the 500lb. mark.

The simplest kind of experiment is one in which two groups of animals are treated in different ways. The difference in growth or production between the two group averages then shows the effect of the treatments. However, if by chance one of the groups is made up of better animals, the difference, of course, may mean nothing. The normal way of overcoming this difficulty is to use such a large number of animals that the law of averages will even out the inherited quality of the groups.

2. Domestic animals, especially cows, are so big that large groups would make an experiment very cumbersome and expensive. This in turn would limit very narrowly the amount of experimental work which could be done.

It might be possible to breed strains of smaller animals for research, but as these animals would not be of the same type as those used by farmers, experimental results would not necessarily apply to their animals. If that possibility is not going to work, is there anything else which can be done to cut down the inherited variation? This is theoretically possible, but the practical problem would be very great. By using a system of intensive inbreeding, a strain of cattle could be obtained which would breed true, or in other words the cows in this strain would not vary in their inherited capacities. This has already been partly achieved in America and England with pigs. Pigs are fast-breeding animals which give wide scope for selection and culling of strains which cannot stand inbreeding. It would take 10 to 15 generations of full-brother, full-sister matings, with all the perils of loss of vigour and constitution, to produce a strain of true-breeding cattle. So great are the difficulties in this direction that such a project has never been attempted.

Fortunately, Nature herself has provided a ready-made solution to these difficulties in identical twins.

Theoretical Value of Twins

Twins in cattle are fairly rare. In New Zealand there is an average of one twin birth in every 100 calvings.

IDENTICAL TWIN CALVES . . .

Most twins are ordinary or fraternal twins which have developed from two different eggs fertilised by two different sperms. Generally they are no more alike than full brothers or full sisters and show the same type of inherited variation. They may or may not be of the same sex.

Identical twins, on the other hand, are animals which have developed from a single fertilised egg which has split early in development. Such twins are very rare, and because of the way they have been formed they are really identical. They carry the same inherited characters because they come from the one egg and the one sperm. They look alike and are always of the same sex. When treated differently they should react differently and the difference between them should be a direct measure of the value of the different treatments.

Obviously, if all this is true, identical twins have tremendous possibilities for research. Only a few animals would be required and the time, labour, and cost would be reduced, while the accuracy of the results obtained would be beyond all question.

Practical Use in Research

That is the theory. What is the practice?

Though the existence of identical twins has been known for some time, research workers have until recently been extremely doubtful about their possible use because of difficulties which might be expected in location and collection. However, in the past 5 years over 200 sets of identical twins have been collected at Ruakura, thanks to the splendid co-operation of farmers in the surrounding districts. Today they range from calves to 5-year-old cows and they make the largest collection in the world.

The first thing was to test the theory of their special suitability for research. A number of sets were reared together under the same conditions and carried through their first production season. During this time measurements were made of all the characters which might be important in cattle work. These uniformity trials, as they are called, enable measurements to be made of the special suitability of twins for research. Results have more than come up to expectation. For growth one set of identical twins are so much alike that they can replace with the same accuracy 20 sets of ordinary cattle. Therefore, in a calf-feeding experiment, 5 sets of identical twin calves provide a very accurate answer, whereas 100 sets of ordinary calves would be needed to provide the same accuracy.

In their production they are very similar. The average difference in production within sets for the first 9 sets in milk was only 8lb. of fat for a complete season. As these records were produced under ordinary grass conditions, where it was impossible to control the amount of food eaten, the performance is remarkable. It has been calculated that for milk and butterfat studies one pair of identical twins is equal to 40 to 50 pairs of ordinary stock. Thus it will be understood why at Ruakura, apart from straight breeding experiments, a large proportion of the experimental work with cows is being done with identical twins.

However, it is also expected that identical twins will provide the answer to many urgent breeding questions. At present it is very difficult to measure the worth of production records made under varying conditions of feeding, and it is thus impossible to select breeding stock with the necessary accuracy. Proper selection of breeding animals is now even more important than before because of the wide use to which some animals may be put through artificial insemination. By splitting a number of identical twin sets and putting them under widely-varying conditions it will be possible to measure more exactly the relationship between the two main factors which influence production, breeding, and feeding.

Large-scale Trial in Progress

A large-scale trial designed to throw light on problems of this type is now in progress at Ruakura.

Fifteen sets of identical twin heifers have been split into three groups, each of 10 cows, in such a way that equally-accurate comparisons can be made between the three groups. The cows in group A are given a full grass ration, plus hay and silage when grass growth is slow, and in addition 1lb. of concentrates for each 5lb. of milk produced. The cows in group B are run on the same area as the A cows, plus hay and silage when necessary, but no concentrates are fed. The C cows are run on a pasture area which is only 60 per cent. of the area of that used by the B group and are fed hay and silage in the same proportions. It will therefore be possible to compare the production records of identical animals on widely-differing systems of feeding. These systems actually have their approximate equivalents in practical farming. The A cows are fed similarly to those of a farmer who relies to some extent on the sale of breeding stock and so feeds his cows to get the maximum production. The B cows are fed in the same way as herds with which the aim is to get the maximum per cow production on grass alone. The cows in group C are under-fed at times of the year when pasture is in short supply, as is the practice on a great many farms.

Identification and Purchase

To allow studies on these and other important questions to continue, farmers in the Waikato and South Auckland districts who believe they have a set of identical twins are asked to advise Ruakura by collect telephone or letter. The telephone number is 4791, Hamilton, and the address Ruakura Animal Research Station, Private Bag, Hamilton. Farmers writing to the station should give their full address, including road and district.

As soon as possible after advice is received an officer from Ruakura will visit the farm and inspect the twins. If they are identical, they will be bought at £2 10s. per head, plus 1s. 6d. a day to cover the cost of rearing. Older calves and pedigrees will be bought by arrangement.

Identical twins are always of the same sex, and, apart from white patches, which may vary in size and shape, they must look absolutely alike. They must be of the same colour. This is very important, because it has been found that 90 per cent. of those twins which have been found to be not identical have been of different colour, and in most cases this can easily be seen. In addition the head shape must be the same and the hair pattern very similar. The hair whorls, which are usually on the forehead, poll, and back, should be of the same type and be in approximately the same position on each calf. Both heifer and bull twins are required, but as only a limited number of bulls are wanted, requirements are usually met early in the season. It is also hoped that the requirements for heifers will be met by the middle of August.

The co-operation of farmers in the collection of identical twins again this year will be warmly appreciated.

Amendments to Rules for Testing Dairy Herds

DECISIONS have now been made regarding the all-cow rule and the acceptance of grade cows for test under the systems operated by the Dairy Division of the Department of Agriculture. Details will be published at an early date and in the meantime the Director of the Dairy Division, H. A. Foy, has announced the following general conditions.

On and after April 1, 1950, no entries will be accepted unless every pedigree cow in the herd which is in milk is placed under either Certificate-of-Record or Government Official Herd-Test. Provision is made for the exemption of certain records, including those of unsound cows.

The Dairy Division will accept grade cows, irrespective of numbers, from breeders at present on its lists or who have been on its lists in recent years. For breeders testing under C.O.R. or O.H.T. for the first time, grades will be accepted, provided that where the herd contains more than 20 grade cows at least half the herd is pedigree. Grade cows will be tested on a similar basis to "group" cows, and the monthly returns will be forwarded to the appropriate Herd Improvement Association for figuring and issuing and will be regarded as group returns.

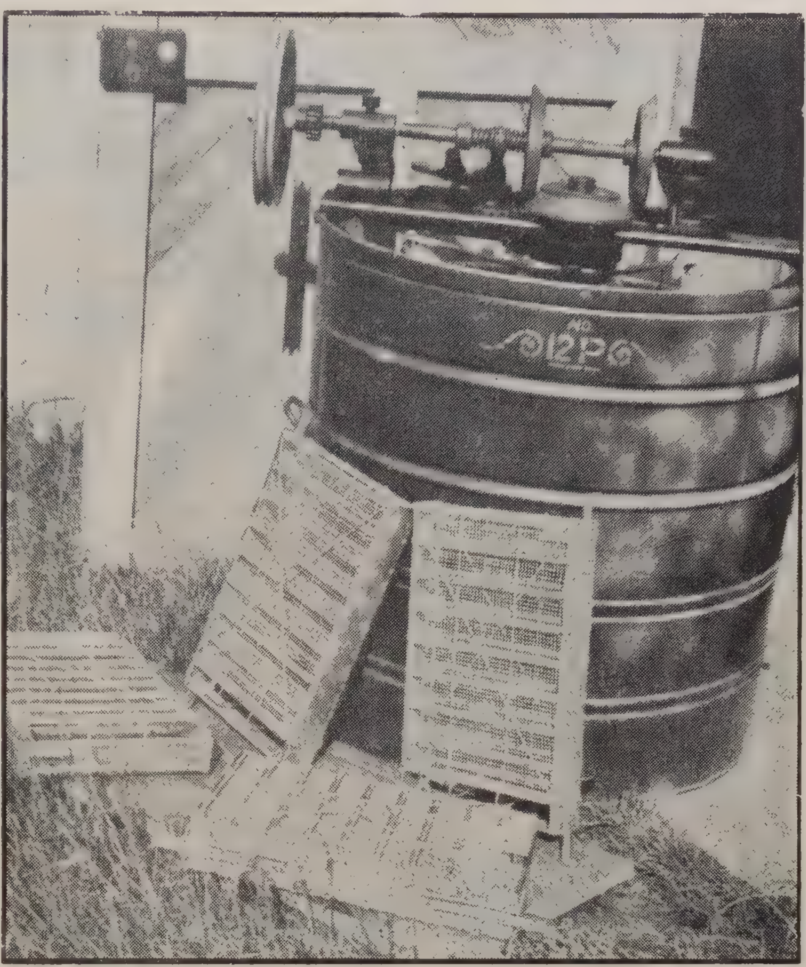
INTERNAL AND EXTERNAL PARASITES OF POULTRY

The methods of prevention of internal and external parasites of poultry and cure of their infestations are described in the Department of Agriculture's Bulletin No. 327, "Internal and External Parasites of Poultry." The bulletin, which is a reprint from the "Journal" of two articles by A. C. Howse, Veterinary Officer, Department of Agriculture, Wellington, is available from the nearest office of the Department of Agriculture.

Care and Management of Honey-extracting Equipment

By C. R. PATERSON, Apiary
Instructor, Department of
Agriculture, Hamilton.

THE efficient running of mechanical equipment allows work to be done with the least amount of delay. This applies to the honey house as much as it does to the modern workshop. This article deals with the care and correct adjustment of honey house equipment, so that unnecessary delays during extracting may be avoided.

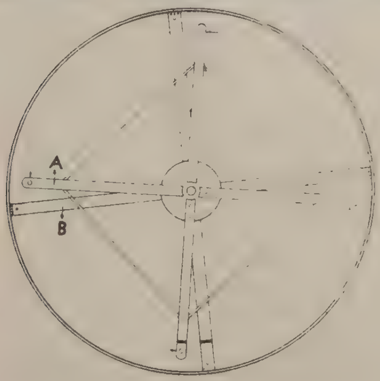


A four-frame extractor with baskets dismantled for thorough cleaning.

DELAYS due to the wrong adjustment of mechanical equipment during the extracting season, besides being a great annoyance, can prove very costly to the beekeeper. Because of the comparatively short duration of the honey flow, honey has to be extracted quickly to enable empty combs to be replaced on the hives to give the bees space for the storage of more honey. A breakdown at this period can very easily mean the loss of many pounds of honey. Every day counts when the honey flow is good, as scale hives have shown that over 16lb. of honey can be collected by a single colony in one day. The efficient beekeeper therefore makes sure that all mechanical equipment needed in the honey house is thoroughly overhauled and a trial run made well before the extracting season begins.

Care of Extractors

Small extractors, as well as the larger ones, require a thorough check over at the end of each season. The most likely spot where trouble may occur in extractors is the lower bearing. This is located in the bottom of the extractor, and because of its inaccessibility it very often does not get the required amount of lubricant. Lack of oil or grease in these lower bearings is not generally noticed until the bearing breaks down. If all extractors were completely dismantled for washing at the end of the season, a thorough check could be made of the bearing. It is only by removing the reel from the extractor that this can be done. This offers a certain amount of difficulty in the larger machines, but it should be done periodically if breakdowns are to be avoided.



Reel of four-frame extractor showing mark on the spider corresponding with similar mark on the reel. In this position baskets can be correctly assembled. A—Spider. B—Reel. Arrows indicate the pins which fit in the bottom of baskets.

The best way to wash the extractor at the end of the season is as follows: If it is a basket machine, all baskets should be removed. They are generally numbered and should always go back into the same position. Beekeepers may find that after this has been done the baskets do not reverse as freely as they did before dismantling. This will most likely be due to the spider, which has moved round out of position and is not meshing with the same baskets as it did before.

The diagram at bottom left shows how the spider and reel should be marked before any attempt is made to dismantle the machine. When this is done and the baskets are marked to correspond to the same marks on the reel there should be no difficulty in assembling all parts into the same relative position as they were before. An extractor well washed in cold water to remove all honey and wax particles and then scalded with hot water and well dried will remain in new condition for many years.

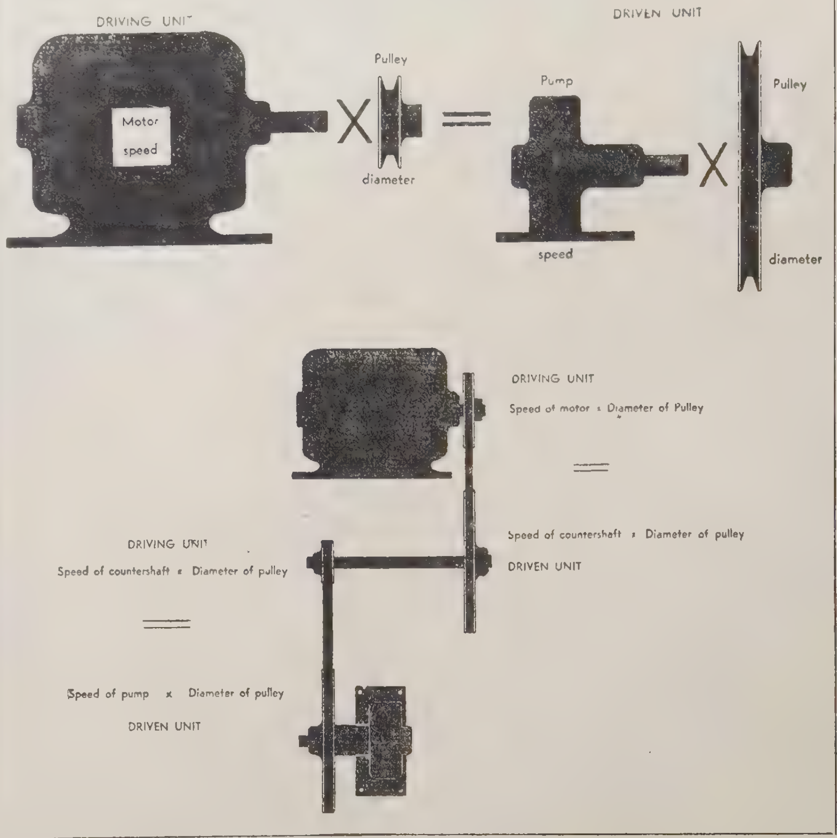
Loose belts are a source of considerable annoyance. V belts and pulleys should be used as much as possible. Correct alignment is important, otherwise excessive wear is caused and belts are liable to come off when the load is put on the machine. Check all alignments as shown in the diagram at the bottom of page 34. If all this work is done in the off season, there is more time to ensure a satisfactory job.

Speeds of Extractor

The correct speed of an extractor is that which will extract the honey in the shortest time without damaging the combs. It should be remembered that the smaller machines have a slightly faster speed than the larger ones. Should an alteration in speed be desired, this can be done by changing one of the pulleys. A larger pulley on the motor or driving shaft increases the speed, while a larger one on the driven machine will reduce the speed.

Knowledge of how to calculate speeds and sizes of pulleys is very useful, especially when installing new machinery. The diagram at right shows how the calculations are made: The diameter of the driving pulley multiplied by the number of revolutions it makes per minute (motor) is equal to the diameter of the driven pulley multiplied by the number of revolutions it makes per minute (extractor). The above rule does not make any allowance for belt slip.

METHOD OF CALCULATING SPEEDS AND SIZES OF PULLEYS


DRIVING UNIT
DRIVEN UNIT
Motor speed
X
Pulley
diameter
=
Pump
speed
X
Pulley
diameter
DRIVING UNIT
Speed of motor x Diameter of Pulley
=
Speed of countershaft x Diameter of pulley
DRIVEN UNIT
DRIVING UNIT
Speed of countershaft x Diameter of pulley
=
Speed of pump x Diameter of pulley
DRIVEN UNIT

Steam-heated Uncapping Equipment

Uncapping knives are apt to spring small leaks unknown to the beekeeper. The soldering of copper to steel is never very satisfactory and the beekeeper must be constantly vigilant for the detection of faults. A leak in this piece of extracting equipment can cause a considerable amount of harm, as it is very seldom noticed in its initial stage. In the meantime sufficient moisture may have been added to the honey to cause high moisture content of the total crop. As approximately a fifth of the total honey extracted comes from uncappings, no such risks should be taken and the knife or plane and all rubber tubing should be sound and without leaks.

Honey Pump

The honey pump, because of its simplicity of construction, is very often neglected in the annual overhaul of extracting equipment. As most honey pumps are of the sliding leaf pattern, it is very necessary to dismantle the pump completely and thoroughly clean all parts. The two springs which keep the leaves separated should be well dried after washing and then smeared in oil. The oil can be removed when reassembling the pump before extracting.

The slightest air leak on the intake side of a honey pump causes trouble. Large bubbles of air and very little honey on the delivery side indicate an air leak either on the intake pipeline or the pump itself. Therefore, in assembling, make sure all joints are perfectly tight and well fitting.

V Belts and Pulleys

V belts and pulleys are generally supplied in A or B section. The A section belt measures ½in. and the B section 21/32in. across the widest part. V pulleys are sold according to the diameter, which is always measured on the pitch line, which is approximately half the depth of the belt. The load capacity of belts varies with factors of speed, arc of contact, and type of load.

One of the many advantages of a V belt drive is the large variety of pulleys available for giving quick variation in speed to any machine.

Summary

1. Clean and sterilise the extractor as soon as extracting is completed and store over winter in a dry place.

2. Check over bearings, paying particular attention to that at the bottom of the extractor.

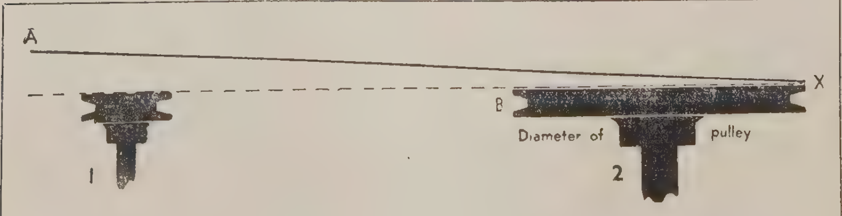
3. See that all pulleys are aligned correctly and where possible use V belts and pulleys.

4. Check over uncapping knife and rubber tubing for any leaks.

5. Dismantle and thoroughly clean honey pump.

6. Reassemble all equipment before beginning next season's extracting. Have a trial run to check up on any readjustments necessary.

Beekeepers who face the coming season with all their extracting equipment running correctly will experience the pleasure of harvesting a honey crop without any annoying expensive delays.



Method of aligning two pulleys. Fix string at X, pull tight at A, and move string slowly until it just touches pulley at B. Now check pulley 2 for alignment.

Distribution of "Journals"

SUBSCRIBERS to the "Journal of Agriculture" can greatly assist the work of distribution by:—

1. Giving notice of change of address promptly.
2. Notifying the old address as well as the new one. The address cut from the last wrapper received is very helpful.
3. Printing names and addresses in block letters.

Exchange must be added to cheques drawn outside Wellington. Payment by postage stamps should be avoided. Stamps of large denominations cannot be accepted.

OAT VARIETIES : SPRAYING WEEDS IN GROWING CROPS

SEASONAL NOTES Contributed by the EXTENSION DIVISION

THE acreage of oats necessary to meet this country's requirements has decreased very considerably in comparison with that of the 1920-30 period. The oat crop, however, must still be regarded as an important one in the general economy of primary production, and the quantity being grown today is barely sufficient for New Zealand's needs.

THE plant breeders of the Agronomy Division of the Department of Scientific and Industrial Research are endeavouring to provide new and better varieties for the needs of specific districts where different problems in oat growing are experienced.

In the early days when export to Australia was a major feature of oat production in Southland, the varieties grown were of less importance to the overseas buyer than they are to the local miller today. With the changed conditions even the varieties grown 20 years ago now find little favour.

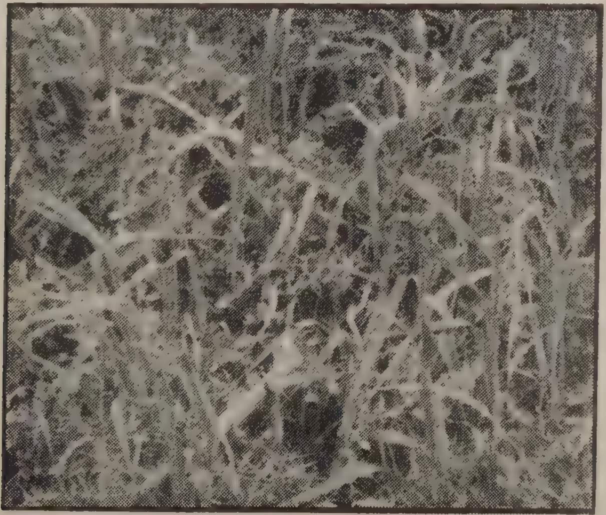
Oats may be classed as milling oats, feed oats, or dual-purpose oats.

The common varieties of milling oats are not of a wide range, but there are distinct types from which the farmer may choose.

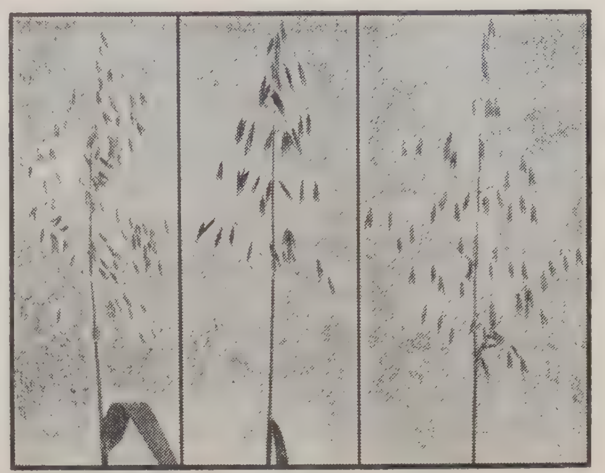
The milling oats most favoured are Gartons Abundance and Gartons Onward, with Spitfire and Royal Scot finding increasing favour with Southland farmers. Onward and Abundance both supply high yields of good milling quality grain, but frequently prove unsatisfactory at harvest due to the susceptibility of Onward to straw break and of Abundance to excessive lodging. Spitfire, a comparatively-new variety, yields almost as heavily as Abundance and produces good milling-quality grain, though it has a tendency to produce a slightly higher proportion of small oats. Royal Scot yields on a par with Spitfire and produces a good milling-quality grain, but this variety is prone to "blast" or "white heads," a condition which shows as unfilled glumes on the panicle.

Neither Spitfire nor Royal Scot is susceptible to straw break as experienced with Gartons Onward, and neither variety is more susceptible to lodging than is Gartons Abundance.

Another variety that has been tried is Binder, which shows a good flour-extraction figure but is unpopular because of the high proportion of small grains produced.



Californian thistles in a wheat crop showing typical distortion after treatment with a hormone weedkiller. Sufficient control of the thistle was obtained to enable a clean crop to be harvested.



Oat varieties, from left: Gartons Abundance, Algerian, and Dun.

Russet oats, a variety used in Canterbury and not yet grown in Southland, has not found widespread favour. Here again the proportion of small grains produced is the cause of a lack of popularity. This variety, however, was put on the market as a dual-purpose oat, the standard of its grain for milling being high when classed with the major chaff or greenfeed varieties such as Algerian, Dun, or the less-important variety Grey Winter.

As far as milling oats are concerned it appears unlikely that Abundance or Onward, the two most popular varieties, will be displaced on the market at present. Certified seed of the variety Abundance, produced from a reselected line supplied by the Agronomy Division, is now available from mercantile sources.

For greenfeed the varieties Algerian and Dun are the two most satisfactory. Both produce best when autumn sown and each is capable of supplying a first-class chaff oat crop. The variety Black Supreme is another useful oat which can be either autumn or spring sown. Farmers claim that this variety harvests as an early crop. Each of these three varieties produces coloured and rather thin grain not favoured for milling. The variety Winter Grey is usually autumn sown for greenfeed.

Achilles is a newly-introduced oat of Canadian origin which shows promise as an alternative to Algerian for greenfeed and chaff. It is likely to be less unpopular as a milling oat than Algerian. Certified seed of both these varieties, the produce of reselection work at the Agronomy Division, is now available.

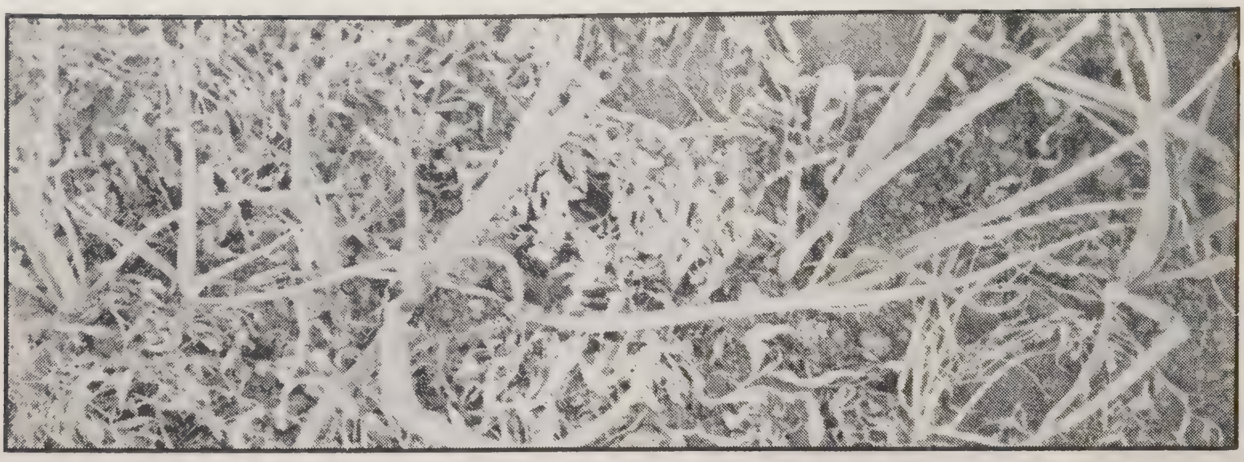
The General trade classification of oats is as follows:—
White or "Gartons" (including all milling varieties).
Algerian (including Grey Winter).
Dun.
Black.

FARMERS and other users of chemical weedkillers must observe certain precautions in the use of these materials to control weeds in crops. In the first place non-selective materials such as sodium chlorate must never be used in widespread applications, while even the so-called "selective" weedkillers will damage a wide range of crops.

The following list summarises the materials that can be used to control a number of troublesome weeds in the crops specified:—

Power kerosene can be used on carrots and parsnips only. All other crops will be severely damaged or killed. The kerosene should first be tested on a small patch, as some lines will damage carrots. Spraying should be made after the first fernleaf appears and not later than the 4-fernleaf stage if tainting is to be avoided.

D.N.O.C. weedkillers can be used in onions and leeks after the 3-leaf stage is reached and in peas after they have grown 6in. high. They are also satisfactory with cereal



A satisfactory kill of weeds infesting an onion crop obtained by spraying with sulphuric acid. After the 3-leaf stage onions are resistant to sulphuric acid, whereas the majority of weed species are killed.

crops, linseed, and linen flax, but none of these crops should be sprayed in the early seedling stage.

Hormone-type weedkillers in water solutions are safe to use in cereal crops after they are 6in. to 8in. high, grass-seed crops, linseed, linen flax, potatoes, and maize. In all cases light rather than heavy per acre applications should be used.

Brassica crops are not included above. These crops, which include turnips, swedes, cabbage, rape, chou moellier, and kale, are all highly susceptible to damage by any of the above materials and must on no account be sprayed.

Peas, lupins, lucerne, onions, carrots, leeks, beetroot, pumpkins, parsnips, beans, sugar beet, and mangolds are liable to be damaged by hormone-type weedkillers and should not be sprayed with these materials. Of this list it will be noted that carrots and parsnips are resistant to power kerosene and onions, leeks, and peas to the D.N.O.C. weedkillers.

Oil-based solutions of hormone weedkillers should not be used on crops, as they are more liable to cause injury than water solutions. Care must always be taken to see that excessive amounts of material are not applied, as these may damage even relatively-resistant crops.

All crops grown for grain or seed must not be sprayed after the seed head emerges. Seed production may be impaired by treatment at this stage or the germinating capacity of seed produced may be reduced.

The majority of weeds found in crops are in some degree susceptible to one or other of the chemical weedkillers mentioned, and it should be noted that complete eradication of weeds is not always necessary. If the shoot is damaged sufficiently, the crop may be able to come away and a clean crop may be harvested before the weeds have recovered sufficiently. Nevertheless some weeds have proved resistant to moderate applications of weedkillers.

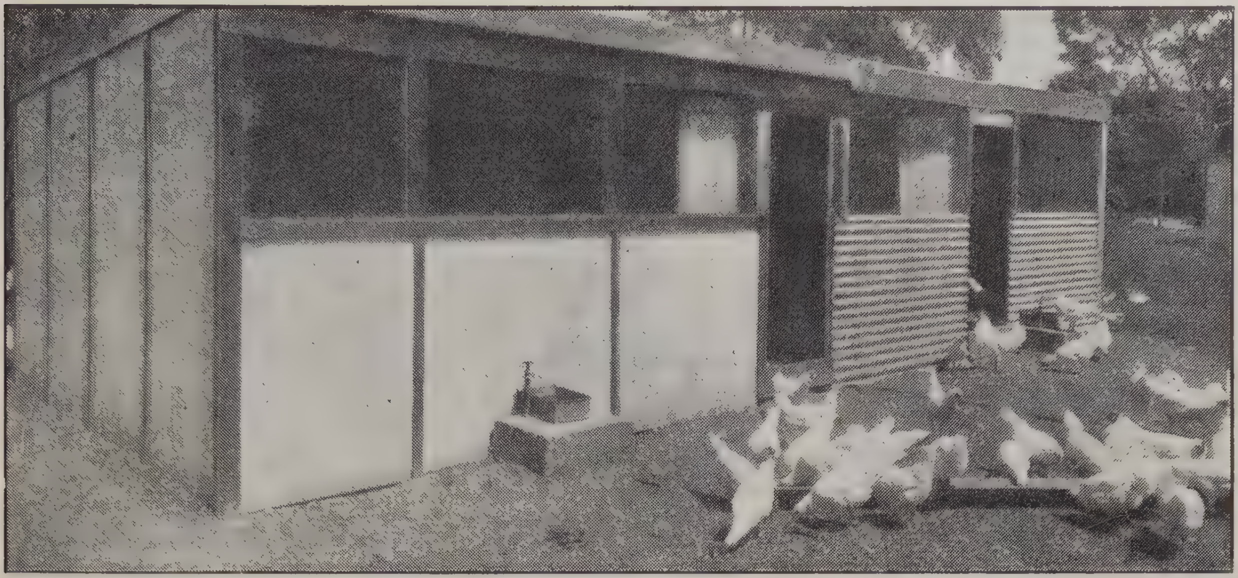
Most weeds are killed by power kerosene, but chickweed, fumitory, stinging nettle, scarlet pimpernel, sorrel, and all grasses are resistant to D.N.O.C. weedkillers, and black bindweed, cleavers, chickweed, staggerweed, scarlet pimpernel, speedwell, wireweed, black nightshade, catchfly, spurrey, redshank, tares, and all grasses are more or less resistant to hormone-type weedkillers. In all cases, but particularly with the D.N.O.C. compounds, the weeds are more susceptible as seedlings. Crops are also more susceptible to damage when young and must not be sprayed in the early seedling stage.

Farmers should not rely on chemical weedkillers to control weeds in crops, but rather should practise clean farming and good husbandry, using the chemicals when for reasons beyond their control a weedy crop is produced. Experimental evidence indicates that even resistant crops are to some extent harmed by weedkillers and increased yields will result only in those cases where the beneficial effect from the control of weeds is greater than the adverse effect of the weedkillers on the crop.

METEOROLOGICAL RECORDS FOR MAY

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
				Absolute maximum and minimum					Maximum fall		
		Approx. mean	Difference from normal	Maximum	Minimum	Total fall	No. of days of rain	Difference from normal	Amount	Date	
Kerikeri	201	57.2	+ 2.2	69.0	38.0	7.50	18		2.03	8	108.2
Auckland	160	56.4	— 0.2	66.3	43.3	5.68	17	+ 0.70	1.46	28	112.2
Tauranga	10	53.8	+ 0.5	69.1	31.1	7.87	18	+ 3.03	3.05	8	128.7
Ruakura	131	51.6	— 0.1	66.8	29.0	4.12	14	— 0.46	2.16	8	115.4
Rotorua	980	50.2	+ 0.5	64.0	31.0	11.59	14	+ 6.13	3.81	8, 28	106.9
Gisborne	12	52.8	+ 0.0	67.2	33.8	6.10	15	+ 1.61	1.62	5	103.4
New Plymouth	160	54.1	+ 0.7	64.3	39.4	5.74	10	— 0.15	3.46	8	156.7
Napier	5	52.8	+ 0.4	65.9	35.5	4.68	13	+ 1.47	1.10	3	126.1
Taihape	2157	47.8	+ 1.3	61.7	31.0	4.03	12	+ 0.70	2.23	8	
Wanganui	72	52.6	+ 0.7	67.2	34.3	3.71	9	+ 0.48	1.11	9	141.3
Palmerston North	110	51.0	+ 0.5	67.0	29.8	2.82	12	— 0.58	1.29	8	135.5
Waingawa	350	50.0	+ 1.0	65.8	30.4	2.32	11	— 1.68	0.67	9	107.5
Wellington	415	51.7	+ 0.5	64.9	36.1	3.19	12	— 1.15	0.69	11	127.6
Nelson	24	51.0	+ 0.5	63.2	32.4	6.38	10	+ 3.23	1.88	25	156.7
Blenheim	12	50.3	+ 0.3	66.8	30.1	2.52	7	+ 0.22	1.26	8	151.5
Hokitika	12	48.6	+ 0.4	62.4	29.6	13.44	9	+ 3.99	3.64	25	161.1
Hanmer Springs	1225	43.9	— 0.6	65.0	21.0	2.12	7	— 2.48	0.86	9	109.5
Christchurch	22	47.4	— 0.1	61.1	27.6	1.73	11	— 1.15	0.70	10	107.4
Ashburton	323	46.5	+ 0.6	66.0	25.0	1.16	8	— 1.33	0.61	9	93.1
Timaru	56	45.5	— 1.2	64.2	28.4	1.10	6	— 0.41	0.70	28	109.3
Alexandra	520	41.4	— 1.5	62.1	21.7	0.95	8	+ 0.02	0.37	28	92.6
Taieri	80	44.8	— 1.1	70.2	23.7	2.18	9	— 0.12	0.71	28	
Invercargill	32	45.2	— 0.5	68.0	21.0	1.41	12	— 2.79	0.57	27	113.5

Household Poultry: Unprofitable Birds should not be Kept—Obtaining Quality Stock—Buying or Breeding—Day-old Chicks or Perching Pullets



THE statement that "Every hen dies in debt" is heard all too often.

If it were made in jest to account for a low rate of return from household hens, it would be understood by many to excuse inferior laying stock, poor management, unsatisfactory housing, or even all of those factors, but it is stated so sincerely and so frequently by people who, after running a few hens for a short time, have given up poultry keeping that many families with backyard space for pullets are deterred from trying their hands at poultry management. In this month's article W. L. McIver, Poultry Instructor, Department of Agriculture, Dunedin, gives advice on controllable factors which influence the backyard poultry keeper's profit and loss account.

FROM the carefree attitude of many householders toward their hens it is difficult to conclude whether the fowls are kept as a non-paying hobby or as a means of obtaining eggs, especially during the months when they are in short supply, but with a total disregard of their production cost. Some backyarders do not even reap the benefit of a winter supply of eggs because of their neglect to replace at least some of the older birds each year with pullets. Too many people retain their hens for 5 years and more, and some candidly admit they never kill a hen.

The three main reasons for this are that the owner does not know how to recognise a layer from a non-producer, has a repugnance toward killing, plucking, and gutting a hen, or comes to look on the birds as pets, making it almost impossible for him to kill and eat them after their good efforts as pullets. Admirable as some of these viewpoints may be, the owner should rather condition himself to regard the hens as egg factories, so that as soon as they cease to be profitable as layers they fall into their next useful category—excellent table meat. Even if the owner feels that it would be akin to cannibalism to consume these old friends, they should still not be retained but either sold or given away. These articles should have taught the tyro to distinguish between a good layer, a poor one, and a non-producer, but if the owner has insufficient confidence to do the first culling on his own, he should call in an experienced friend for a demonstration. A later article will deal with killing and dressing poultry.

Preliminary Planning

Frequent newspaper references to an egg shortage and to so-called rationing illustrate the need for more householders to run a few fowls. Lack of experience or a small-sized city section should not be allowed to excuse an inclination to postpone making a start on a venture which can be interesting, instructive, and useful to the family.

The fact that a householder has had no previous experience with hens is only a minor disability, which can be overcome by a little reading and the application of common sense. Even the modern tendency to subdivide urban sections to the smallest area permissible by local by-laws does not preclude poultry being kept in most cases. The section must be very small indeed to prohibit all chance of arranging enough space for a fowlhouse. Though a fenced-in run is desirable as an adjunct to the laying house, it is not essential. If the choice lies between a small house with a small run and a larger house without a run, there are good arguments in favour of a more commodious shed in which pullets can be kept intensively.

Notwithstanding the present-day cost of building materials, in the long run it is better to avoid makeshift substitutes and to build attractively in permanent and first-class materials. The initial building cost must be considered carefully when poultry keeping is begun and a sufficient number of birds run to make the venture economic. Building a house for 3 dozen pullets does not cost 6 times as much as for half-a-dozen, nor is the work of looking after the poultry increased in ratio to the number of birds kept. Partly because of increases in building and feeding costs, it is essential to study the economic side of the business and to see that a sufficient number is kept to ensure that the initial cost will be recouped within a reasonable time, but an equally-important consideration when planning the venture is that a proper sense of pride is justifiable when the effort proves successful. Poultry keeping should not be started or continued without sufficient planning or calling for experienced advice.

Quality Stock is Worth While

Obviously, no amount of good management can do a great deal to increase the egg-laying ability of an inferior strain of poultry, and pullets

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HEADING PHOTOGRAPH: **The buyer of stock 8 weeks old or older should be assured of obtaining healthy birds past the danger of succumbing to chicken diseases and properly culled. Green and Hahn Ltd. photo.**

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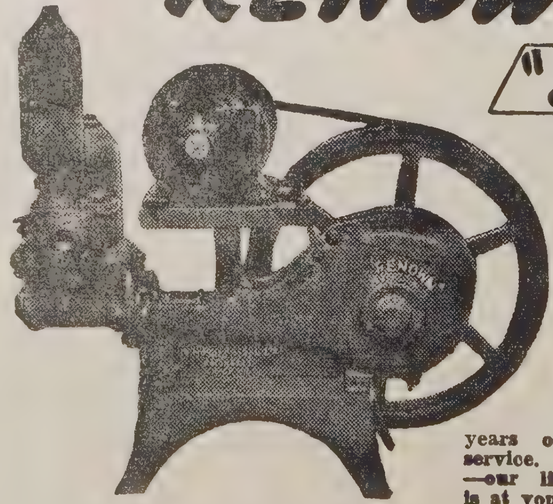

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of the best obtainable strain cannot lay to their full potential if not looked after properly. However, the latter factor should not influence the inexperienced backyarder to buy inferior and cheaper stock on which to practise until he learns enough about fowls to warrant buying superior stock. The influence should be the opposite, and stock should be bought from a dependable hatchery, with a reputation for a good egg-laying strain, free from a history of disease, and with known longevity. These attributes will make learning good management by practical experience all the easier for the novice.

Culling, breeding type, and the merits of heavy breeds, light breeds, and cross-breeds have been discussed in earlier articles, but merely deciding the type of fowl to be kept does not end the problem.

Buying or Breeding

The problem includes consideration of how the strain is to be perpetuated and the henhouse kept filled—whether it is better to buy stock each year or to run a breeding pen. The answer depends largely on individual circumstances and each poultry keeper must work it out for himself. In general, buying stock is easier for the backyarder than breeding it. Even assuming that the backyarder has a sufficient number of good breeding-type hens, he is unlikely to have a high-quality cockerel and a separate pen and run in which to accommodate the breeders. A run is more desirable for breeders than for laying pullets.

The cockerel must be regarded as more important than the hens, and a slight fault which could be overlooked in a female must not be tolerated in the male. The female is no less important than the male in the mating, but the cockerel almost invariably is bred to several hens and the risk cannot be taken that he will pass on his fault to all or a large proportion of the chicks.

Another difficulty is the hatching. Though buying an incubator and building an incubator room are unnecessary for a few chickens, hatching by a broody hen presents grave disadvantages frequently overlooked. Apart from the difficulty of getting a hen to go broody early in the season, especially when the owner has only light-breed birds, any internal or external parasites or infectious diseases the mother hen has are almost certain to be passed on to the chicks.

The sideliner running 200 to 400 fowls can afford an incubator and hatchery, but, apart from whether he can spare the time necessary to look after the breeding and hatching, he has to consider two important aspects: First whether he has sufficient breeding-type hens to produce enough hatching eggs to give him all the annual replacement stock he needs: and, second, whether with the size and type of incubator and brooder available he can hatch enough chicks each hatch to fill the brooder, thus keeping rearing work to a minimum.

If a sideliner has found a dependable hatchery and is satisfied with the stock, there are sound reasons for buying, but otherwise it is a choice between trying another breeder or running a breeding pen. The rearing work is reduced if larger batches of chicks are hatched or bought at a time, but rather than overcrowd the brooder it is better to rear an extra batch or two.

Day-old Chicks or Perching Pullets

If the householder decides to buy stock, the choice must then be made between day-old unsexed chicks, sexed chickens, and perching pullets. Most commercial poultry farmers have pullets available at 6, 8, and 10 weeks, 4 months, and when reddening up just before the laying stage, the price increasing with each age group.

For householders with only 1 laying pen, perching pullets, as old as possible, are advisable; they can then be kept in temporary, more or less makeshift, shelter until near the point of laying, when the old hens can be disposed of and the pullets installed in their house after it has been cleaned. If the backyarder has suitable housing available, the rearing of chicks from the day-old stage will be found very interesting and not unduly difficult; sideliners running more than 100 birds should certainly rear the chickens from a day old.

Pullets are not properly trained to perch by 6 weeks of age and some are not fully perching even at 8 weeks. The buyer of stock 8 weeks of age should be assured of obtaining healthy birds past the danger of succumbing to chicken diseases and properly culled; thenceforth mortality should be low.

The main danger in buying perching pullets is that the farmer may have overstocked his range area for too long a time, causing the ground to become "poultry sick." Diseases to be expected then are coccidiosis, infectious fowl paralysis, leucosis, and intestinal worms. Articles on all these troubles have appeared in the "Journal of Agriculture" during the past 12 months. These diseases may not show up for weeks or even months afterward.

The impression that poultry diseases are very rife is widespread, but as a result of recent scientific discoveries and improved management the incidence of disease is surprisingly low.

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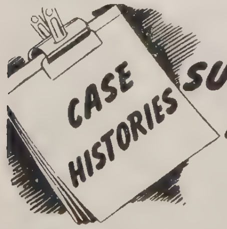

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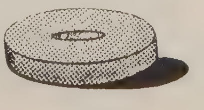

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TREE SURGERY

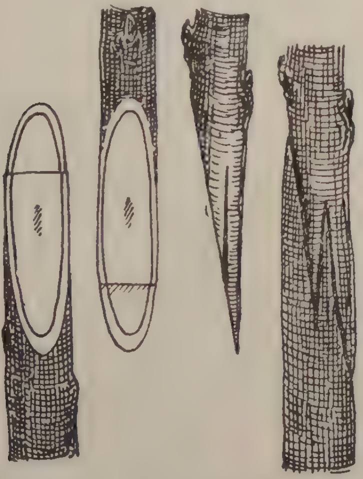
THE term "surgery" can be applied to many operations necessary to raise and develop fruit trees, including pruning to produce shape and stimulate fruit production, to allow easy access for spraying and harvesting, and to enable sunlight to reach all parts of the tree; budding and grafting of young stock; reworking of older trees to change them to more profitable varieties; root pruning, and the treatment of wounds and damaged trees. All these operations must be done with care and skill and at the right time for the most successful results.

GRAFTING in particular requires care in establishing correct contact between scion and stock, and all operations in which the use of saw or knife is necessary produce only poor results if done haphazardly. The subjects covered in this article by J. O. Anderson, Orchard Instructor, Department of Agriculture, Masterton, are those with which the commercial and private grower will have to deal at some time.

Method of Budding

Budding is the insertion under the bark of the stock plant of a single bud bearing little or no wood. This is bound with a suitable material, such as raffia. The cut on the young stock is made T shaped about 3in. above ground level, the lower portion or leg of the T being lifted slightly with the heel of the budding knife. The bud is removed from the bud stick, starting about ½in. above the bud and cutting carefully downward to ¼in. below it and removing as little as possible of the wood. The bud is slipped into the open cut made on the stock and bound carefully, care being taken to avoid covering the bud itself.

Budding is done during early autumn when sap is not in full flow but is sufficient to effect a good union. Early the following spring the stock is cut back to just above the bud, which soon starts into growth, making the new tree.



Whip graft for use when stock and scion are equally thick.

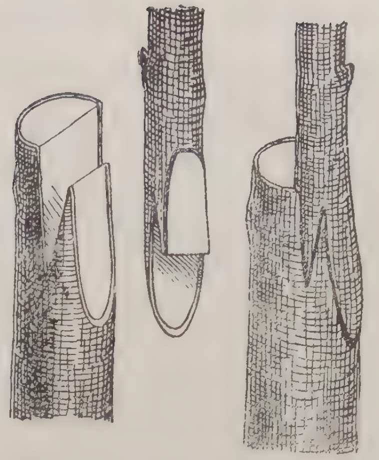
Types of Graft

Grafting is the insertion of a scion or twig comprising 2 to 4 buds into the stock, usually into an incision made in the wood. It is classified into various methods, chiefly referring to the position of the union on the tree and to the method by which scion and stock are joined:—

Root grafting, in which stock is entirely a root.

Crown grafting, which is performed on the crown or collar of the plant, just at the surface of the ground.

Stem grafting, in which the scion is set on the trunk or body of the tree below the limbs. This method is used occasionally with young trees.



Whip graft for use when the stock is thicker than the scion.

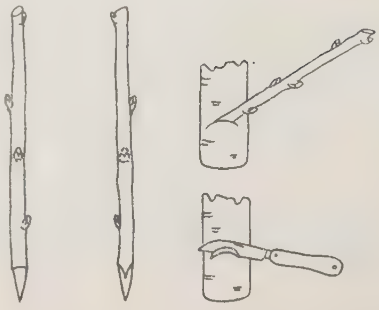
Top grafting or grafting on to the branches of the tree. The method of inserting the scion depends on the size of the limb to be grafted. The union of scion and stock, like the union of bud and stock, depends on the growing together of the cambial tissue of the two. Therefore it is essential that the tissue lying between the outer bark and the wood of the two should come closely in contact. Scions are cut in winter when trees are being pruned or at any time before the buds swell in

[Hope Cross and Richardson photo.

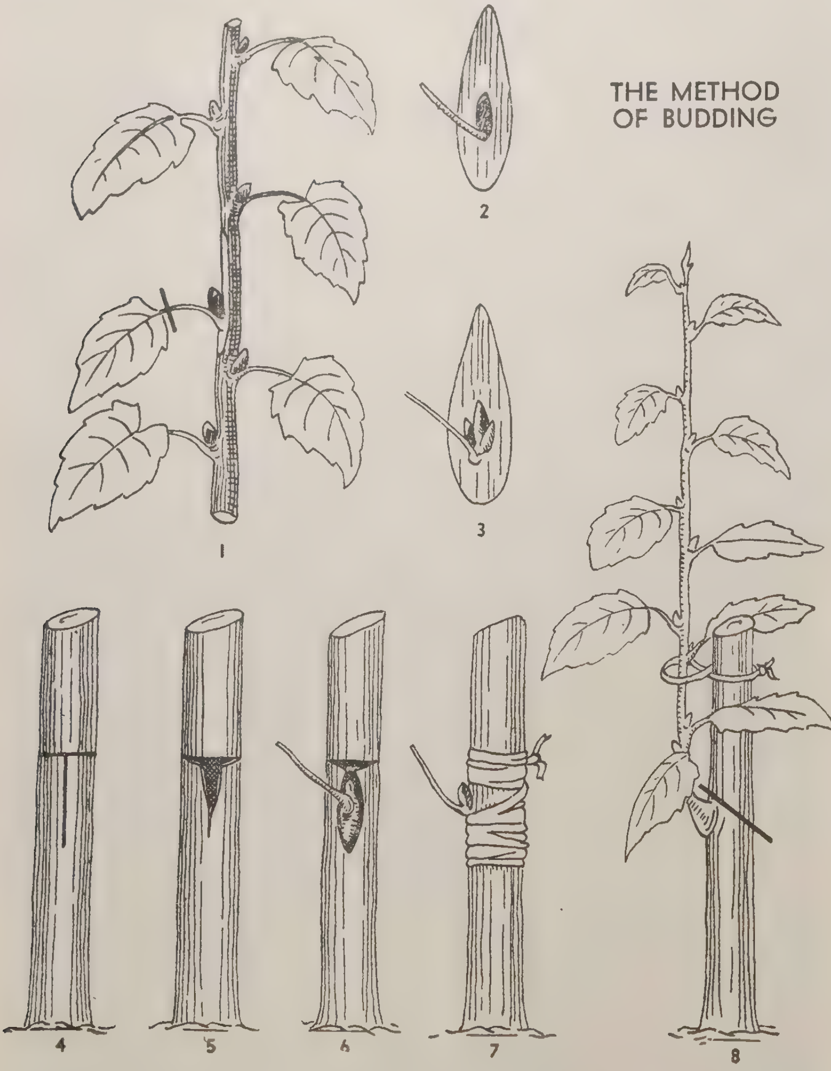
An apple tree which has been refurnished and on which the grafts are making growth. The variety is Kidd's Orange Red on Swaar.

early spring. Only the previous year's growth is used in all ordinary cases. The scions are heeled in in a cool place or buried in sand. Only well-formed and mature buds should be used.

Whip or tongue grafting is used only on small stocks, usually those 1 or 2 years old. The diameter of the stock should be no more than ¾in. The scion and stock are cut diagonally, the cut extending from 1 to 2in. according to the size of the stock. A vertical cleft or tongue is then made in each and the two joined by inserting the tongue of the scion into the tongue or cleft of the stock. The parts are bound together with raffia or some other suitable material. The wound must be protected by a sealing material such as grafting wax over the bandage.



Oblique side graft.

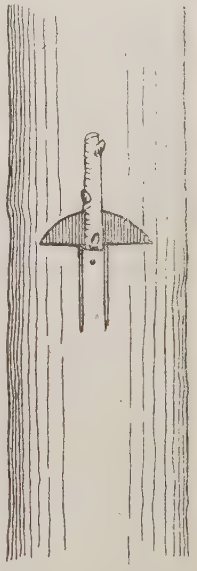


THE METHOD OF BUDDING

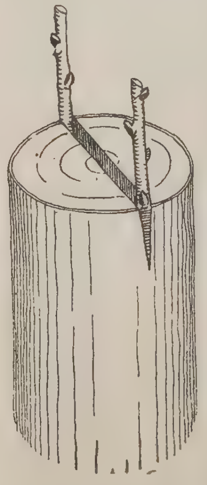
1—A shoot of the current season's growth with buds; the shape to cut the bud and the place at which to remove the leaf are shown. 2—A single bud ready for insertion. 3—A triple bud ready for insertion. 4—The incision made through the bark of the stock. 5—The bark opened. 6—The bud inserted. 7—The bud tied. 8—Growth from the bud tied to the snag of the stock, which will be cut off where marked after midsummer.

Saddle grafting is a simple and useful method for the shoots of small growing plants. The scion is split at the lower end and fitted on to a wedge cut in the end of the stock. The union is tied and sealed in the same manner as a whip graft.

Side grafting: There are various methods of inserting a scion into the side of a stock. One of the simple ways is to make an oblique cut about 1in. long in the stock with a thin chisel. The scion is cut wedge shaped, as in cleft grafting, and is pressed into the incision until its cut surface is concealed in the stock; the wound is tied and sealed. The stock is headed back to aid in deflecting part of the tree's energy into the scion.

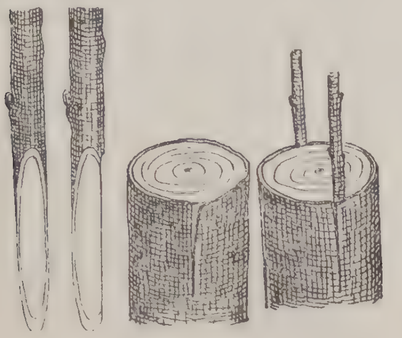


A good side graft is made by making a half-moon cut and removing the bark. From the centre of the horizontal cut two vertical cuts about 1½in. long are made just the width of the proposed scion, which is cut obliquely the same length as the cuts on the stock. The edges of the scion are trimmed slightly and a small piece of the toe of the scion is removed. The scion is pushed under the strip of bark and secured by a tack or fine nail driven through the strip of covering bark and the scion into the limb, and finally sealed. Removal of the half-moon shape of bark from the stock allows the scion to fit securely against the limb.



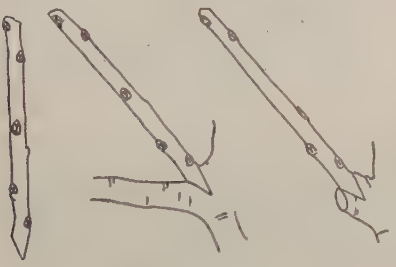
Cleft grafting: The stock is cut off squarely and split across the centre of the cut and down about 1 to 1½in. Into this split is inserted the scion, cut to a wedge shape. The scion must be placed at the edge or rim of the stock, the cambium layers of each coming in close contact. This method is adopted particularly with large stocks. Before being grafted the top of the stock should be trimmed carefully to a smooth surface with a sharp knife. When the graft is in position it should be sealed thoroughly.

Bark grafting also is suitable for large stocks. The stock is prepared in the same way as for cleft grafting, but is not split to take the scion. Instead 2 vertical cuts, starting from the rim, are made 1½ to 2in. long to the depth of the bark and just the width of the scion to be used. The scion is cut obliquely and the cut edge trimmed lightly. It is slipped carefully under the bark of the stock between the 2 cuts, secured with a fine nail, and well sealed. The scion should fit firmly, touching each side of the cut.



Bark graft.

Stub grafting is very useful and easy to do. It is used on branches with a diameter up to ¾in. when a tree is being refurnished. The branch to be grafted is cut back to about 18in. and a cut made 8in. from the main limb. This cut should slant toward the base or main limb of the tree and penetrate halfway through the branch. The scion is cut to a wedge shape and inserted by easing the branch gently to open the cut and allow the scion to fit into place. When the branch is released the spring holds the scion in place. Care must be taken not to bend the branch too far or it will split at the cut and not hold the scion. No binding is needed, but the union must be well sealed.



Stub graft.

Refurnishing a Tree

The refurnishing method of grafting usually is applied to older trees. The mechanism of the tree is not thrown out of balance as it would be if the tree were cut low down and grafted, and the tree is enabled to come into full bearing within a short period.

According to the size of the tree, it is cut back about a third, and the branches are reduced to within 18in. of the limbs. Attention must be given to ensuring that the resulting tree is evenly balanced. Branches not required should be removed and all cuts carefully trimmed smooth. The type of graft to be used depends on the size of the branch; for heavier cuts the cleft or bark graft is used, and the whip or stub method is applied to smaller branches. An average-sized tree may take 30 to 40 grafts. Too many are better than too few, as surplus grafts can be removed in later years.

Pruning

Fruit trees are pruned for several reasons, all of which bear an important part both in the development of the tree and in the production of fruit. In pruning a young tree for the first 3 or 4 years an orchardist should endeavour to produce an evenly-balanced structure by developing leaders which will be the main limbs of the tree; usually 6 main branches are maintained. From these main limbs subsidiary branches are developed to ensure even but not crowded spaces between the main limbs, and from the main and subsidiary limbs fruiting laterals and spurs are developed.

These methods are carried out during the life of the tree. The main object the orchardist must bear in mind when pruning and shaping a tree is to maintain an even balance, thereby leaving sufficient space between limbs for easy access for spraying and harvesting, and allowing sunlight to reach all parts of the tree.

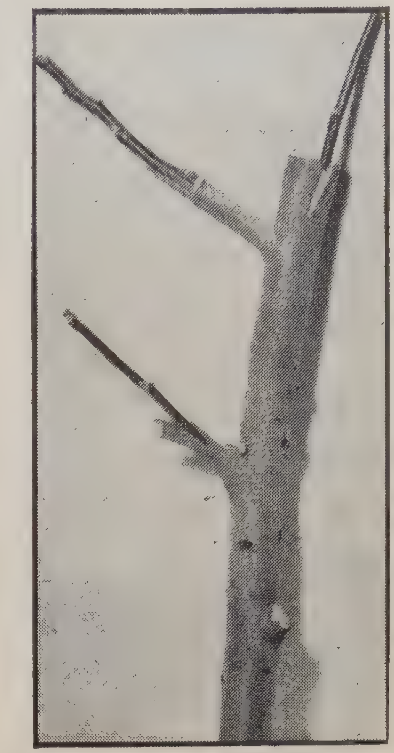
All varieties of apples do not have the same bearing habits—for example, a variety such as Rome Beauty bears its fruit mainly on the tips of laterals —so care must be taken in selecting laterals to be shortened and to be left uncut. Sturmer and Delicious are two varieties which produce a large number of fruit spurs, which should be thinned out regularly and systematically. If it is not thinned, a tree produces a large quantity of small fruit and the tree becomes weakened.

Winter Nelis pears produce masses of spurs up the limbs and branches. They should be spur pruned to induce growth of spurs on the laterals.

Stone-fruit trees are pruned to develop shape in the same way as apple and pear trees, but their fruiting habit is slightly different. The peach and nectarine produce their fruit on 1-year-old wood, so the pruner must maintain a regular growth of new wood each year. Plums and apricots, as well as producing fruit on the new wood, develop a spur growth which also carries fruit. These spurs require attention as they develop; they should be shortened if they are too thick and removed where not required.

Removal of Limbs

When removal of a branch becomes necessary it should be cut close to the parent limb without leaving a stub. The wound should be trimmed smoothly with a sharp knife, particularly round the edge, and covered with a sealing compound to prevent decay. This allows an even callus to form, thus healing the wound.



Three kinds of graft used when refurnishing a tree, ready to be tied or tacked and sealed. From the top: Bark, whip, and stub grafts.

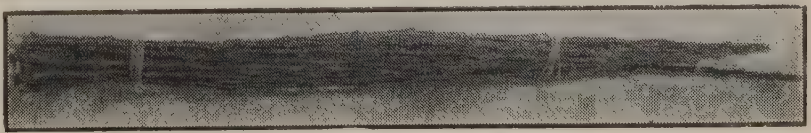
Bracing of Split Limbs

Strong winds or a heavy crop of fruit may cause limbs to split at the fork. If not too badly damaged, they can be repaired with care and the balance of the tree maintained.

The limb should first be shortened at least a third. If the limb is large, a strong stake may be driven into the ground at a suitable distance from the base of the tree to support it before the wound is treated. The wound is then trimmed carefully, especially along the edges of the torn bark, and the limb lifted sufficiently to make a neat fit, bringing the edges of the bark together. The limb is bound firmly to the stake and, to prevent side movement, bound to other limbs. The wound should be bound tightly and sealed thoroughly to exclude the air.

Root Pruning

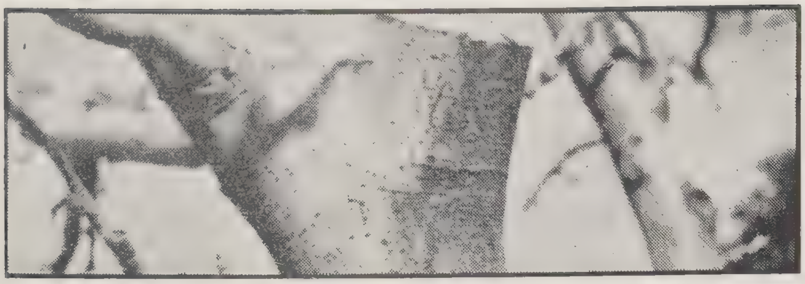
Strong, vigorous trees which tend to make excessive growth and produce low yields of fruit can be root pruned



[Green and Hahn Ltd. photo.

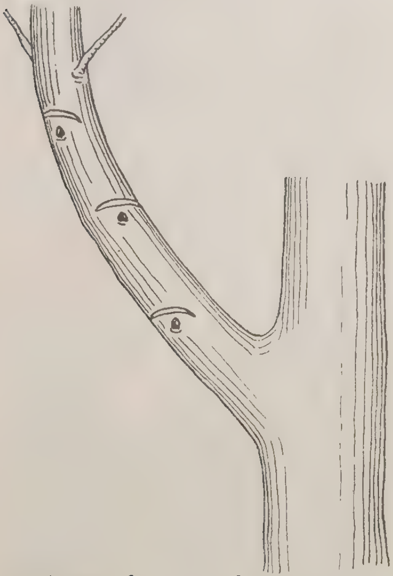
Good types of grafting wood.

TREE SURGERY



[*Sparrow Industrial Pictures Ltd. photo.*
This cut was made too far from the main branch, leaving an ugly stub which will not heal over readily.

to help retard the growth, thus inducing the development of fruiting spurs. Root pruning should be done with care and not too severely. A large tree should be pruned about 8ft. from the base, and only a portion of the roots should be cut. The roots should be bared and cut with a sharp knife, leaving the surfaces of wounds smooth. If necessary, more roots can be treated the following year until the desired effect has been obtained.

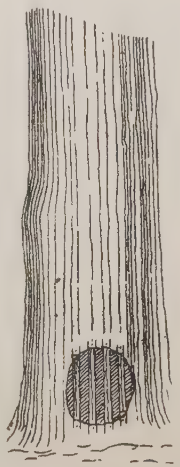


Positions of cuts to force dormant buds.

Forcing of Dormant Buds

On apple trees which have been long pruned in early life often only 2 or 3 of the top buds will break into growth at each pruning cut, leaving the remainder of the limb bare. Granny Smith and Rome Beauty are very subject to this habit, which can be overcome by selecting well-placed dormant buds, making a double cut 1in. above each one, and removing a strip of bark 1/16in. wide and 1 to 1½in. long. This operation should be done in early spring. The restricting of the sap flow will force the buds into growth.

Bridging Trunk Wounds



Tree trunks damaged by implements should receive immediate attention. The wound should be trimmed to sound bark with a sharp knife and smeared with a tree-wound dressing. In early spring the wound if severe may be bridged by the insertion of a number of grafts about 1½in. apart. In the course of the operation the bark of the wound should again be trimmed back to a clean, sound area. For each graft a double cut exactly the width of the scion is made at the top and bottom of the wound to the depth of the bark. The strip of bark between the cuts is lifted slightly and the graft, cut to the right length with a long tapering wedge shape top and bottom, is inserted carefully into the cuts, making a double-ended graft. It is made secure by a fine nail or tack at each end. When all grafts are in position the whole area is carefully sealed with grafting wax. If the take is good, the grafts will soon take up the function of conducting sap flow.

Trimming Wounds and Saw Cuts

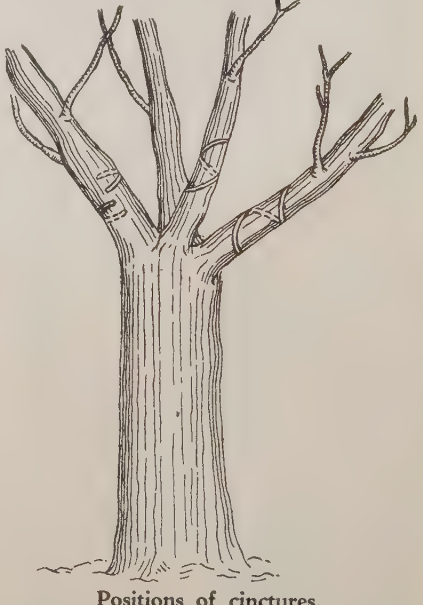
All wounds and saw cuts should be trimmed to a smooth surface, particularly at the edges of the bark, to allow an even callusing. Wounds should then be painted or sealed with wax.

A wound left untreated seldom heals satisfactorily, but remains in danger of infection by spores of silver blight, of which decay is generally the outcome.

Cincturing

To induce vigorous trees or limbs to set fruit cincturing is sometimes used. By restricting the flow of sap the growth is retarded and the formation of fruit spurs encouraged. It can also be used to balance the growth of an unevenly-growing tree. The vigorous portion is cinctured in spring, thus encouraging the main sap flow to the weaker part of the tree, which is forced into more vigorous growth.

The operation is simple. A double spiral cut (¼in. wide is sufficient) is started near the base of the limb and continued upward until the limb has been circled once; the strip of bark is removed. Alternatively, 2 separate double cuts can be made by cutting halfway round the limb on one side and removing the strip of bark, then, about 3in. above, making a second cut in the opposite direction and again removing the bark. The wound is then sealed or bound with a waxed strip of rag to keep out the weather and fungus spores. The bandage can be removed in about 2 months, when the wound will be healed over.



Positions of cinctures.

[*Sparrow Industrial Pictures Ltd. photo.*
A branch should be removed by being cut close to the main branch and the edges trimmed with a sharp knife.

Establishment and Management of Grasslands

ASHBURTON COUNTY PASTURE COMPETITION 1948

AS a means of raising the standard of farming, whether in regard to crops or pastures or any other aspect of farming, farmers' field competitions offer unlimited scope. They provide a basis for discussion, are instructive, and are a ready, practical means of demonstrating good farming methods. Naturally the value of a competition hinges very largely on the support accorded it—where large entries can be compared the conclusions drawn are likely to be much more reliable than would be the case where relatively-few entries are considered. In this article G. K. McPherson, Instructor in Agriculture, Department of Agriculture, Ashburton, discusses the second pasture competition held in Ashburton County.

THE initial farmers' field competitions conducted by the Department of Agriculture in New Zealand dealt with root and forage crops. This was perhaps natural, as such crops could be weighed and weight per acre was the most important factor to be considered. Then followed competitions which included hay and silage. Here, again, weight of material per acre, quality, and the efficiency in the building of the stacks, all more or less concrete factors, were the main points for consideration when judging the entries. It was not until some years later that pasture competitions were inaugurated. Actually the first pasture competition conducted by the Department of Agriculture in New Zealand took place in the spring of 1928 in North Taranaki. Only in recent years, however, have pasture competitions been held in Canterbury, no doubt because Canterbury is largely an arable farming district and in the past crops have always been looked upon as more important than grass.

A pasture competition was held in the Ashburton County for the first time in the spring of 1947. The competition was organised and conducted by the Ashburton County pasture committee, which consisted of representatives of Federated Farmers, mercantile firms, the Chamber of Commerce, and the Department of Agriculture. The competition created considerable interest, 105 entries being received. Because of the excellent support given by the farming community, the committee decided to hold a further competition in the spring of 1948.

Judging System

In the case of a mangold or a swede competition there are two main factors to consider: Weight per acre and quality. Weight per acre can be measured accurately and quality can be determined fairly readily. In the case of a pasture competition, however, there is no means of measuring accurately the many points which contribute to good pasture. It could be said with a fair degree of accuracy that the judging of pastures falls into somewhat the same category as judging stock in the show ring—judging in both cases must remain largely a matter of opinion. However, just as stock within a breed, for example, must possess certain basic features typical of that breed, so also must good pastures conform to certain standards. The botanical composition of the sward, its density and vigour, the utilisation of the growth, and how stock are likely to thrive are perhaps the main points for consideration when judging a pasture.

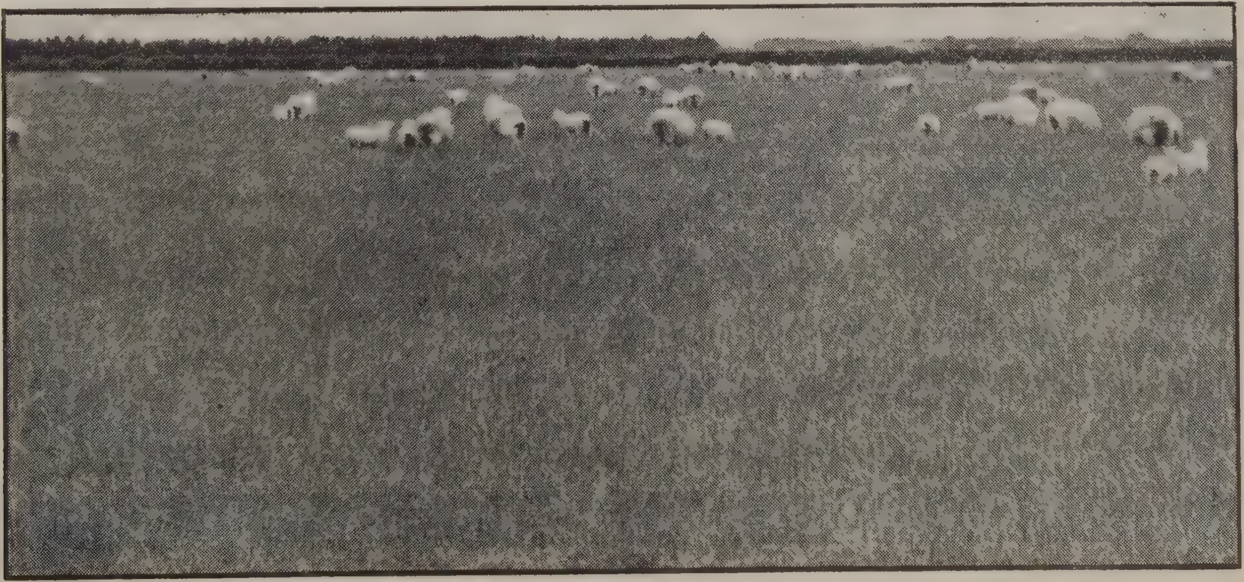
In the competition held last spring in Mid-Canterbury the competition committee gave as a basis for judging the following scale of points:—

	Points
Pasture composition	70
Density of sward	20
General appearance and pasture control	10
Total	100

This allocation may not be perfect, but it is a useful guide. As a result of experience now gained, however, it would seem that a reduction in points for good grasses and clovers from 70 to 60 and an increase in the points for general appearance and pasture control from 10 to 20 would be an improvement.

Method of Conducting Competition

For the purpose of conducting the competition the committee decided to divide Ashburton County into 7 districts, in such a way that the soil type within each district was more or less similar. However, to allow for any differences in the quality of land, the unimproved value of each paddock entered in the competition was determined at the time of judging. Where



Ewes and lambs on good pasture at Methven, Mid-Canterbury.

the value of the land exceeded £10 per acre, a quarter of a point was deducted from the points allocated to the pasture for each £1 in value exceeding £10. Similarly a quarter of a point was added for each £1 in value below £10.

Pastures awarded first, second, and third place in district competitions automatically became entrants for the county competition, which was divided into 3 classes: Class 1—Pastures on land valued at or under £10 per acre (unimproved value) and sown before June, 1946. Class 2—Land valued at over £10 per acre (unimproved value) and sown before June, 1946. Class 3—Best pasture in class 1 over 8 years old. A special section for pastures on irrigated land was also included.

The Ideal Pasture

It is generally recognised that a sward consisting almost wholly of grasses does not make a good pasture. After its first year such a sward usually lacks vigour and has an unthrifty appearance. In the same way a permanent pasture consisting almost entirely of clovers has definite weaknesses, chief of which is its short growing season and lack of variety of feed for stock. A high-yielding pasture—one which will stand heavy stocking, one which will continue to produce over a relatively-long period of the year, and one on which stock will thrive—must contain both grasses and clovers, preferably several species of each. The composition of the ideal pasture is considered to be about 60 per cent. grasses and 40 per cent. clovers. Density in a sward is also very important, as this factor is directly correlated with carrying capacity—a sward must be dense if it is to stand heavy stocking. Efficient utilisation of the growth is also a necessary feature. Continuous close grazing of a sward is undesirable, as also is grazing which permits the growth to become too rank. The presence of weeds and inferior grasses also detracts from the value of pasture, though there is evidence that the presence of some of them in small amounts may not be detrimental, as they provide a change of feed for stock. This seems to apply more particularly where the simple ryegrass-white clover mixture has been sown.

Standard of Pastures

Pastures from almost every district in Ashburton County were represented in the 1948 competition, but because of dry and cold conditions during late September and early October, the number of entries (80) did not reach the previous year's total (105). The adverse weather conditions were also reflected in the quality of the pastures; they lacked some of the bloom and vigour associated with most of the entries of the previous year. Nevertheless the standard of the pastures entered last season was very high, and this applied not only to those on good wheat land, but also to those on the lighter land. Considering that the average age of the pastures entered was slightly more than 5 years, the competition indicated very plainly that the soil and climate conditions in Mid-Canterbury make it possible to establish and maintain excellent pastures; it demonstrated, too, that there is still tremendous scope for pasture-improvement work throughout the Ashburton County.

History of Pastures

Every entrant for the competition was supplied with an application form on which the full history of the paddock was to be set out. Details included features such as the seed mixture sown, method of sowing down, method of sowing the seed, liming, topdressing, and the general management of the area. As the areas entered for the competition no doubt included some of the best grass paddocks in the county, the methods of establishment and maintenance are of interest.

Seed Mixture

In nearly every case a good type of ryegrass and white clover formed the basis of the seed mixture—of the 80 paddocks inspected 65 had been sown with a seed mixture which included white clover. The extensive use of white clover in seed mixtures is to be commended, because it blends in well with grasses to form a dense turf, and turf density is associated with high carrying capacity.

A feature of the competition was the large number of pastures on the good land which were sown with a simple mixture, either ryegrass-white clover or ryegrass-red clover. The aim in sowing either of these mixtures is to produce a dual-purpose sward—one which can be utilised both for grazing and for seed production. No doubt the inclusion in these mixtures of additional grasses and clovers would give a superior grazing pasture, but in general the use of simple mixtures on land suited to seed production is economically sound.

In four of the pastures entered perennial ryegrass had been replaced with short-rotation ryegrass. All of them were on good heavy land. One of the pastures had been harvested on four occasions and the remainder twice. All these pastures still had a good balance of clovers and grass, indicating that short-rotation ryegrass, particularly on the better-lass land and where the rainfall is fairly high, has distinct possibilities.

Baled hay being transported to the Ashburton railway station. Approximately 67,000 acres are cut for hay and silage in Canterbury, of which about 10,000 acres are harvested in Ashburton County. Many of the best pastures entered in the 1948 Ashburton competition had been either hayed or cut for a seed crop.

An excellent white clover seed crop at Highbank. Because pastures are frequently harvested for seed in Mid-Canterbury, simple seed mixtures are commonly sown.

On the lighter land it was usual to augment the ryegrass-white clover mixture with other grasses and clovers. It seems desirable on this class of land to include grasses such as crested dogstail and cocksfoot, thereby placing less reliance on ryegrass, to preserve the balance of clovers and grasses. Where it was sown subterranean clover showed up very favourably. On land too light for white clover to give reasonable results subterranean clover appears worth a place in the seed mixture. Under good management conditions Montgomery red clover also has given results which justify its wider use.

Method of Sowing Down

Of the 80 pastures entered in the competition details of the method of sowing down were available for all but one of the entries. Analyses disclosed that 42 of the pastures were sown down with a cover crop and 37 alone in the autumn after a summer fallow. A wide variety of cover crops was used. Turnips (12 areas) was the most popular crop; then followed oats (10 areas), wheat (7 areas), lupins (6 areas), rape (5 areas), barley (2 areas), and linseed (1 area). Of the 7 district winning pastures, 3 were sown down alone in the autumn after a summer fallow and 3 were sown with cover crops. No details were available for the seventh entry.

It is generally accepted that the best method of establishing a pasture is to sow the grass and clover mixture on its own in the autumn after a summer fallow. However, it seems that good pastures can be obtained under certain circumstances when the grass and clover mixture is sown down with or in a cover crop. Weather conditions certainly play a vital part, but it does appear that if (by liming and topdressing combined with a suitable cropping programme) the fertility and physical condition of the soil are built up, the prospects of success when the pasture mixture is sown down with a cover crop are very much enhanced.

Method of Sowing

Details of the method of sowing were obtained from 72 pastures. An analysis of the methods used disclosed that in 37 cases the seed mixture was sown broadcast, in 18 it was drilled, in 15 it was drilled and broadcast, and in the remaining 2 instances the seed was drilled with the coulters dragging and the spouts removed from the drill.

Of the 7 district winning pastures, 2 were drilled and broadcast, 2 were drilled, 1 was drilled with spouts removed, and 1 was broadcast. The method of sowing for the seventh area was not given. Four methods of distributing the seed were tried, all of which apparently were successful. Judged on the winning pastures alone, however, either drilling or partial drilling gave best results. The type of soil, the climate, the presence or absence of a cover crop, and the condition of the paddock just before sowing are no doubt all factors which influence the farmer in deciding which method of sowing to adopt. On heavy land or light land with a high rainfall the general practice was to broadcast the seed mixture, but on light land with a relatively-low rainfall most of the seed, in the majority of cases, was drilled.

Lime

As it would be probably correct to assume that the majority of the best pastures in Ashburton County were entered, the competition amply demonstrated the value of lime as a factor in pasture-improvement work. Of the 80 paddocks inspected all except three had received lime in varying quantities.

To be eligible for the competition pastures had to be at least 2½ years old. Actually the average age of the pastures entered was 5 years 6 months, and over that period the average amount of lime applied per acre was 2 tons. This represents an average dressing of 7cwt. of lime per acre each year. There is little doubt that the thriving clover growth and vigorous appearance of many of the pastures could be attributed in no small measure to adequate applications of lime. Thirty-three paddocks, 26 of which were on light land, had lime applied to the cultivated ground before sowing down to grass. Under low-rainfall conditions, particularly on the lighter land, the practice of sowing the initial quantity of lime on the cultivated ground appears to be merited.

Topdressing

Superphosphate was almost the only fertiliser used for topdressing and, while most pastures had received one or more applications, there was no evidence that any regular topdressing programme had been practised. The usual application of superphosphate was 1cwt. per acre, some areas receiving this amount each year, some in alternate years, and others at irregular intervals. Information from 71 pastures disclosed that the average amount of superphosphate used per acre was 80lb. per year.

Harvesting for Seed

A large number of the pastures entered in the competition had been hayed or harvested for seed, yet in the majority of cases this did not appear to have had any detrimental effect on the swards. Of the 7 district winning pastures 4 had been harvested for seed, some on more than one occasion. Actually the winning pasture for the county on land valued at more than £10 per acre unimproved value had been harvested on four occasions while the corresponding pasture for land valued at or under £10 per acre unimproved value had been harvested twice.

Where goose grass does not come in and under high fertility conditions, it would seem that the seeding of a pasture does not damage the sward unduly.

DETAILS OF WINNING ENTRY ON LAND VALUED AT MORE THAN £10 PER ACRE UNIMPROVED VALUE

The winning entry in the section for land valued at more than £10 per acre unimproved value was a 12-acre paddock situated on a fertile area of Wakanui clay loam. After being badly damaged by porina in the late autumn of 1943 the paddock was grazed during the winter and spring. It was then skim ploughed and cultivated intermittently right through until the middle of March, 1944. It was then drilled with a mixture consisting of 18lb. Certified short-rotation ryegrass and 3lb. Certified white clover, 1½cwt. of reverted superphosphate per acre being sown with the seed.

After establishment the topdressing programme was:—

Autumn, 1945, 1½cwt. serpentine superphosphate, 1 ton lime per acre.

Autumn, 1946, 1½cwt. serpentine superphosphate per acre.

Autumn, 1947, 1½cwt. serpentine superphosphate per acre.

Autumn, 1948, 1½cwt. superphosphate, 1 ton lime per acre.

In all, therefore, the area in 4½ years received 2 tons of lime and 7½cwt. of fertiliser per acre.

For 4 successive years the area was harvested for grass and clover seed and when not closed for seed production was utilised for grazing.

At the time of judging the sward consisted of an exceptionally dense, healthy sole of short-rotation ryegrass and white clover. No doubt the colour and the vigour of the sward could be attributed very largely to the nitrogen supplied by the heavy coating of dung and urine from grazing animals.

DETAILS OF WINNING ENTRY ON LAND VALUED AT £10 OR UNDER PER ACRE UNIMPROVED VALUE

After a crop of blue lupins for green feed had been taken the area the pasture on which won the section for land valued at £10 or under unimproved value was fallowed and sown down to grass in early December, 1944. Before sowing the seed 1 ton of lime per acre was applied to the cultivated ground. The seed mixture used was as follows: 20lb. Pedigree perennial ryegrass, 3lb. C 23 cocksfoot, 2lb. crested dogstail, 4lb. Permanent Pasture Montgomery red clover, and 2lb. Pedigree white clover, 2lb. subterranean clover (half of it Tallarook strain and half Mt. Barker), and 1½oz. turnips. The seed was drilled without spouts attached, and serpentine superphosphate, at the rate of 1½cwt. per acre. was applied with the seed.

In the 1945-46 season the area was harvested for ryegrass seed and the following year for white clover seed. At all other times the area was grazed.

Topdressing was applied as follows:—

April, 1946, 1cwt. superphosphate and 10cwt. lime per acre.

February, 1947, 1cwt. superphosphate and 5cwt. lime per acre.

January, 1948, 1cwt. superphosphate and 5cwt. lime per acre.

The winning pasture was not only dense, but contained an excellent mixture of grasses and clovers, with very little foreign growth of any kind.

BEST PASTURE MORE THAN 8 YEARS OLD ON LAND VALUED AT OR UNDER £10 PER ACRE UNIMPROVED VALUE

To avoid frequent renewal costs, the establishment on the lighter land of pastures which have a useful grazing life extending over a period of years is important. To encourage interest in these pastures an additional class was included in the 1948 competition for pastures over 8 years old on the light land. Seven pastures were entered, and considering the age of them the standard was very high.

Of the two paddocks which were placed first equal, No. 1 was sown down to grass with rape in November, 1935, the following seed mixture being used: 20lb. perennial ryegrass, 6lb. cocksfoot, 1½lb. crested dogstail, 2lb. red clover, 2lb. white clover, and 2lb. subterranean clover. A mixture of equal quantities of superphosphate and lime at the rate of 2½cwt. per acre was sown with the seed. During the 13 years that the paddock had been down in grass it had received a total of 2 tons of lime and 2cwt. of superphosphate per acre. On three occasions it had been rolled with a heavy roller.

Paddock No. 2 was sown in January, 1938, with a seed mixture consisting of 20lb. Permanent Pasture perennial ryegrass and 3½lb. subterranean clover. Superphosphate at the rate of 1¼cwt. per acre was sown with the seed.

After establishment the pasture received, at different times, the following quantities per acre of superphosphate and lime: 1cwt. superphosphate and 5cwt. lime, 1cwt. superphosphate and 15cwt. lime, 1cwt. superphosphate and 10cwt. lime, 1cwt. superphosphate and 10cwt. lime, 1cwt. superphosphate and 10cwt. lime, 1cwt. superphosphate and 10cwt. lime.

Paddock No. 1 and paddock No. 2 had both been attacked at various times by grass-grub and porina, but had recovered and at the time of judging each carried a good dense sole of subterranean clover and ryegrass. As was to be expected, each contained a certain amount of foreign growth—hairgrass and goose grass in one; sweet vernal and browntop in the other. Nevertheless, considering the age of them, both were excellent pastures.

It is significant that in each case subterranean clover was the principal legume in the winning pastures in this section. If it had not been present, it is extremely doubtful whether the pastures would have remained productive for the time they have been down.

IRRIGATED PASTURE SECTION

Because of the advantage possessed by irrigated pastures over non-irrigated during the dry summer months, a special section for pastures under irrigation was provided. This section was divided into two classes: Pastures sown before June, 1946 (class 1) and pastures sown since June, 1947 (class 2). All pastures entered in the two classes were sown on bordered areas.

Class 1: Of the 11 entries in this class 4 were sown in the autumn of 1945 and the balance in the 1945-46 season. The pastures, therefore, had at least two full irrigation seasons before being judged. Some excellent pastures were seen in this class, but there were others which, for some reason, lacked the vigour and density which it would be natural to expect where water was available.

The variation in the four best pastures was not very marked; all possessed quite a good balance of grasses and clovers, swards were dense, and vigour good. The basis of the seed mixtures in all cases was perennial ryegrass and white clover, plus one or more of the following: Crested dogstail, timothy, or Montgomery red clover. Three of the pastures were broadcast and the other drilled and broadcast. Two paddocks had 1 ton of lime applied to the bordered area before sowing and all four had approximately 1½cwt. of superphosphate per acre sown with the seed. Each paddock had subsequent dressings of lime and superphosphate, and the average application per acre from the time the paddocks were bordered until they were judged was 1¾ tons of lime and about 3¼cwt. of superphosphate. During the 1947-48 irrigation season, which was comparatively dry, the four paddocks were watered regularly from early summer until the end of April.

Class 2: This class was instituted primarily to determine the best method of establishing a pasture on paddocks that had been border diked. In levelling a paddock for irrigation the graders have to shift the topsoil from high spots in the paddock into the hollows. This may leave areas where there is only a thin layer of topsoil, which makes the immediate establishment of good pastures possibly more difficult than where sowing takes place under normal circumstances. Of the 6 entries in this class the 2 placed first equal were sown in November, 1947, and received several applications of water in the late summer and autumn. It would appear that this gave the pastures a distinct advantage over pastures sown later in the season and which did not receive any water. At the time of judging the watered paddocks carried a good sole of clovers and grasses; in the non-watered paddocks, on the other hand, clover, though present, had not developed to the same extent. It will be interesting, however, to see how these latter paddocks develop during the coming summer.

DISPLAY OF TURVES

At the conclusion of the judging turves were taken from the placed pastures in each section and were displayed at the Ashburton agricultural and pastoral show. Each turf had a card attached giving the seed mixture sown and the treatment the paddock had received. The display created considerable interest.

SHEDDER ROLLER ATTACHMENT FOR SIDE RAKE

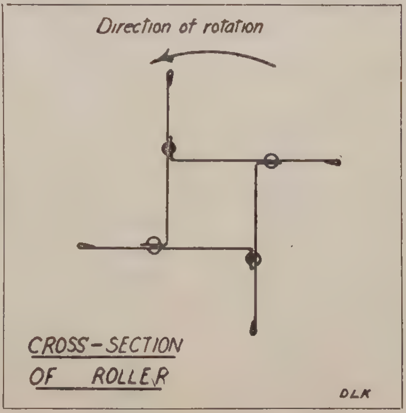
USERS of some British-designed side rakes have experienced trouble in windy conditions, even when the wind velocity is low, because of the jamming of the material between the flyers and the shedder board, causing a stoppage or in some cases a mechanical breakdown. This article by D. L. King, Engineering Research Assistant, Canterbury Agricultural College, Lincoln, describes a solution to this problem evolved by Mr. M. M. McGregor, a farmer at Dunsandel, Canterbury—the removal of the existing shedder board and the fitting of a shedder roller of suitable design mechanically rotated in the same direction as the flyers. This roller removes the material forward off the flyers as they rise past it.

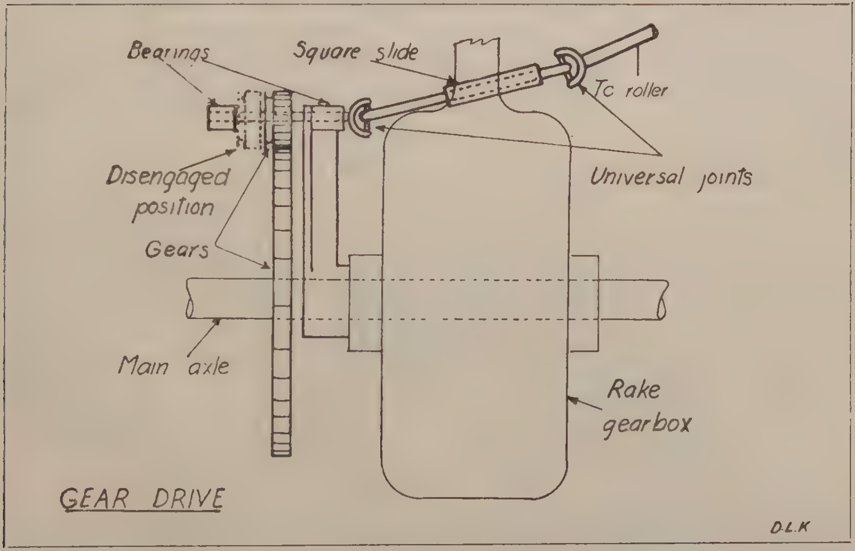
THE attachment described was designed and constructed at Lincoln College and fitted to a British side rake. It was used during the 1948-49 season in a variety of crops, and no stoppages occurred under conditions in which it was impossible to work with a machine fitted with the standard shedder board.

The roller was constructed from 18 s.w.g. sheet metal. The four pieces are riveted together in such a manner that the roller is twisted through one-eighth of a turn along its length, so that only a portion of each flange is being resisted by the material being raked; thus the load on the drive is constant and not a series of impulses. A short stub shaft is fitted to each end; a shaft is not required along its full length as the roller is rigid in itself. The roller must be driven in the direction shown in the diagram; if it is driven in the opposite direction, the material winds around it.

[*Canterbury Agricultural College photo.*

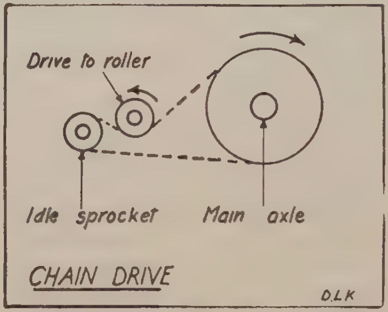
The bearings for the roller should be fitted to the mounting brackets in such a manner that they are self-aligning through a small range. The design of the brackets depends on the make of rake and the materials available. Provision for small adjustments of height and of clearance between the roller and the flyers is desirable. The aim is to have the roller working as close to the flyers as practicable.





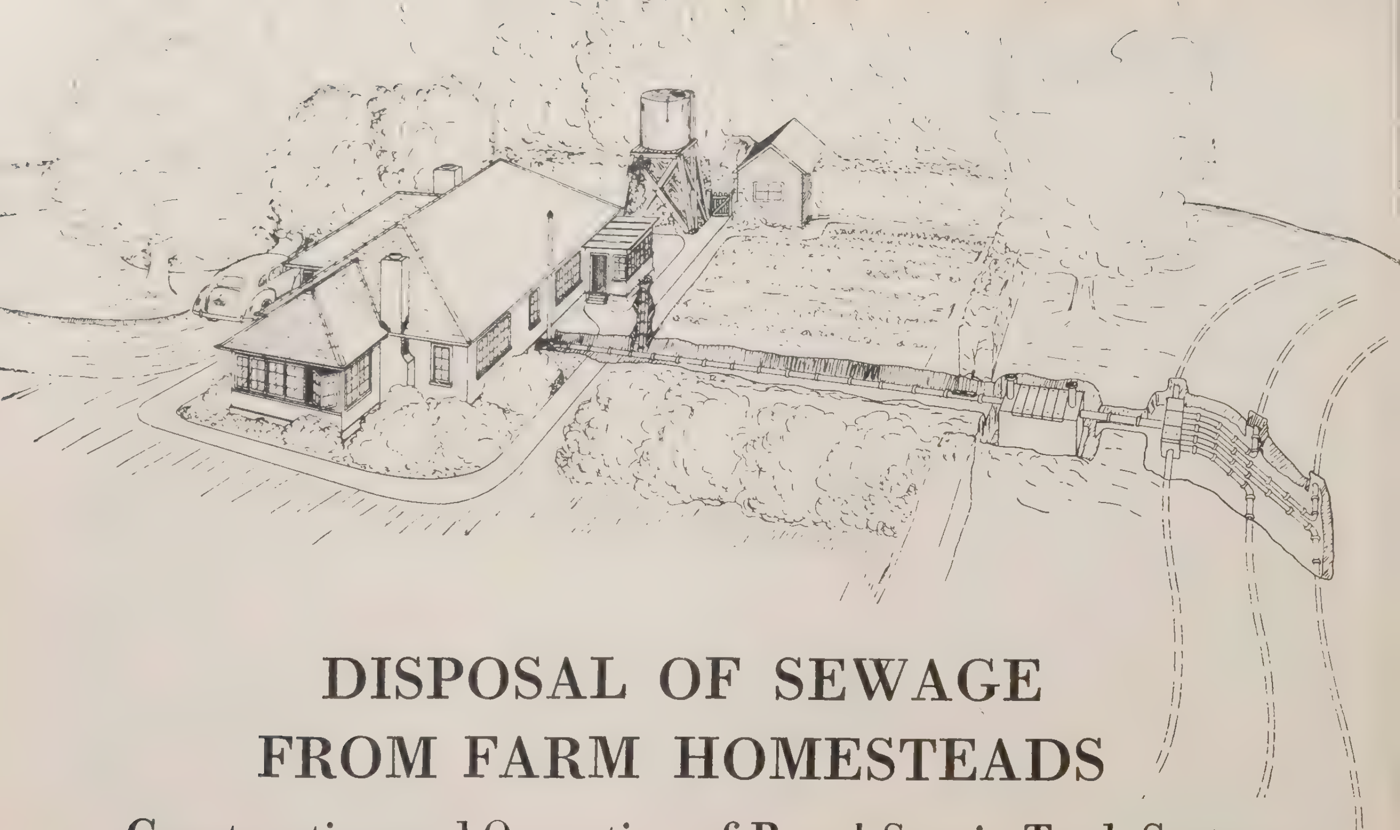
The drive to the roller may be arranged in one of several ways, the choice depending on the make of rake and, if the attachment is being made from scrap parts, the size and type of parts available. A pair of gears from an old pump jack was used for the attachment fitted to the rake at Lincoln College. The gear wheel was keyed to the main axle of the rake and the pinion keyed to a countershaft connected to the roller by a pair of universal joints and a square slide. By sliding the pinion along the shaft the roller could be put out of gear. The roller gave the best performance when driven about five times as fast as the main axle.

A single train of two gears will drive the roller in the correct direction, but if the drive is by chain, it is necessary to use a third sprocket and drive the roller on what may be called the outside of the chain to get the correct direction of rotation.



When the rake is used for tedding it is advisable to remove the roller or increase the clearance, as the flyers may spring out, particularly on a worn rake, and pierce the flanges of the roller.

This attachment is not considered to provide the only solution to the problem, but certainly it is effective. It may have the disadvantage that it would be expensive to make from all new materials, but the cost can be reduced by using scrap or standard parts from another machine.



DISPOSAL OF SEWAGE FROM FARM HOMESTEADS

Construction and Operation of Rural Septic Tank Systems

MODERN amenities so familiar to town residents—electricity, pure water supplies, and sewerage systems—are coming to be regarded more and more as necessities to the rural population. Electricity is now distributed over most of the country and more attention is being paid to water supplies; in some districts large areas have piped supplies delivered to every farm. Where good water supplies are available water closets should be installed with septic tanks for the disposal of sewage where this is practicable. This article prepared by R. C. Lough, of the Design Office of the Ministry of Works, under the direction of H. L. Hume, Chief Designing Engineer, and F. Langbein, Acting Commissioner of Works, deals with the construction of septic tanks and effluent-disposal fields and should assist the farmer who is a handyman to construct his own, subject, of course, to his first obtaining a permit from the local authority in whose district he resides. Very detailed plans and specifications for tanks and layouts are included in Bulletin No. 322, which is obtainable free from any office of the Department of Agriculture, and which should be consulted by anyone intending to install a septic drainage system.

ORDINARY domestic sewage is comprised of human excreta, paper, some food wastes, dishwater, bathwater, etc.

The discharges from the human body contain many kinds of bacteria, including at times some disease-producing types. Pollution of water supplies by sewage may result in epidemics of typhoid, dysentery, and other diseases. Pollution may be caused by underground flow as well as by surface flow.

Proper Disposal Necessary

It is important to regard all sewage as dangerous, and it should be disposed of in such a manner that pollution of water supplies will not result and that disease germs will not be spread by flies and other carriers.

The safest place for disposal of sewage is generally in the top 3ft. of soil, where the action of bacteria tends to render it harmless. Effluent tile drains from septic tanks accomplish this if the water-table remains several feet below the surface and if the location is remote from water supplies.

Disposal of sewage or other waste in very deep pits which reach to the water-table or below it is almost certain to cause contamination of the ground water.

Discharge of sewage, cowshed cleanings, and other farm wastes into surface streams will result in pollution of water supplies downstream.

Common Fallacies about Pollution

The belief that streams purify themselves in very short distances is quite common. The action of sunlight, aeration, etc., does purify stream water, but stream water may not be safe for domestic use for many miles downstream from the point of pollution. Clear, sparkling water is not always safe drinking water.

The statement is frequently made that the effluent from a septic tank is fit to drink. This is quite untrue, as the effluent may be bacteriologically as bad as, and sometimes worse than, the raw sewage entering the tank. Thus the discharge of septic tank effluent to a stream will cause pollution and should not be permitted. The function of the septic tank is to remove the bulk of the solids from the sewage, but the liquor may not be purified at all.

SEPTIC TANKS

From the point of view of comfort and convenience the water closet is a very desirable amenity on any farm as compared with the pan method. The septic tank and water closet are both parts of one installation. It is important to ensure that ample water is available for frequent flushing.

The septic tank is not an ideal disposal system, but for a single household or say two households it is a simple and economical system. In larger communities there are systems available which will give a much more satisfactory standard of purification and which are mentioned at the end of this article; the layout of one type is illustrated on this page.

The degree of purification of the sewage that takes place in the septic tank is poor; all that is accomplished is separation roughly of the sewage into two parts, solids and liquid. The solids settle in the bottom of the tank and go through a process of "digestion" due to bacterial action which results in their reduction in bulk and in easy disposal. The liquid effluent is disposed of in soakage drains as dealt with more fully later.

Common Fallacies about Septic Tanks

Many people think that septic tanks must be hermetically sealed. Actually scum provides all the cover necessary and open tanks work as well as closed ones. It is generally preferable, however, to cover the tank; gas generated in the tank must escape, and in a ventilated tank it is diluted with air and the point of escape is controlled.

The common belief that a septic tank will work indefinitely without cleaning is not true. One of the functions of the septic tank is to pond the sewage flow and reduce its velocity to such a figure that a considerable portion of the solids will settle to the bottom of the tank before the sewage leaves the tank. Of the solids deposited in a tank at the most 40 or 50 per cent. will be converted into liquid, gases, or soluble substances; the balance remains in the tank as sludge or scum. As the tank gradually fills with solids the ponding and settling of solids are reduced. If the clearing of the tank is neglected, the tank may fill with solids nearly up to the level of the inlet and outlet, with the result that though grosser solids may be deposited, there will be far too much solid passing off with the effluent.

Location

Wherever possible the septic tank should be located a reasonable distance from the homestead (regulations stipulate a minimum of 30ft.), and the tank and effluent drains must be kept as far as possible from any well, stream, or other water supply, including underground flow.

The illustration at the top of the opposite page shows a general layout of homestead, sewers, septic tank, and disposal system as installed on a suitable site.

Advice from a Health Department inspector or the local authority's sanitary inspector should be sought where there is any doubt about the suitability of a location.

Sizes of Tanks

Suitable sizes for septic tanks are given in Table 1. The minimum capacity is 300 gallons for up to six people, and the capacity should be increased by 50 gallons for every person in excess of six.

Construction

Before construction is begun inquiry should be made from the local health or sanitary inspector, as many rural local authorities have adopted the Drainage and Plumbing Regulations of the Health Act under which drainlaying and plumbing must be done by registered tradesmen. Dimensions for various sizes of tanks are given in Table 1.

The sewage usually enters the tank and leaves it at a distance of 6in. to 9in. below the level of the sewage in the tank. This ensures that the flow is distributed through the whole body of liquid and not merely on the surface (generally the surface will be covered with a scum); it also ensures that no scum or solids floating on the surface pass out into the effluent pipe.

The tank may be built with a level bottom or a sloping one. The best arrangement is a tank with a level bottom with a sump at the inlet end. The provision of the sump, while making construction somewhat more difficult, will facilitate removal of sludge with a suitable pump.

Two pipes extended to just above ground level provide for ventilation of the inlet sewer and a means of clearing the inlet and outlet tees if they become blocked.

The top slabs, which are of a size that can be handled without great difficulty, are not bedded in mortar, but the joints may be sealed with clay if the filling on top is likely to trickle through into the tank.

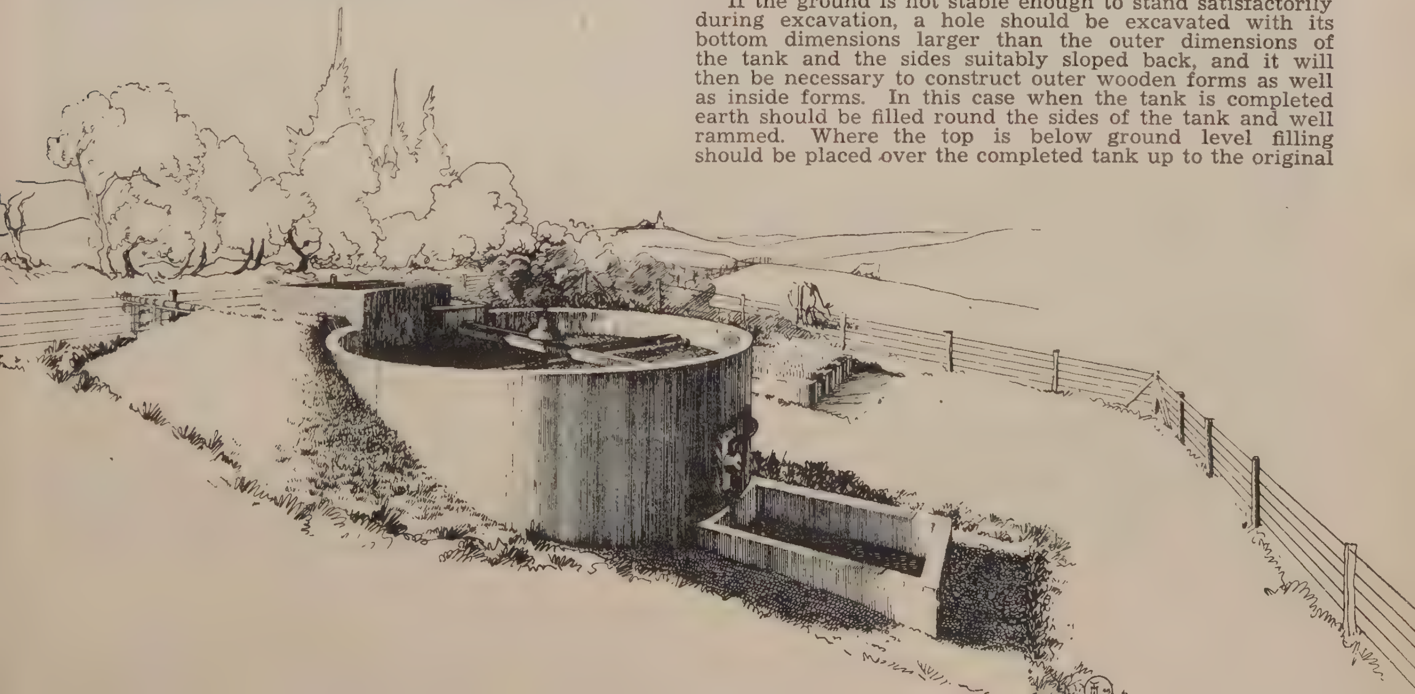
Generally construction will be easier with 6in. than with 4½in. walls, and the thicker walls are preferable, especially where the ground is used as the outer form.

The walls could be built in brick and the floor and top of concrete. The inside walls should then be plastered to give a smooth surface. Table 1 gives the number of bricks and quantities of cement, metal, and sand required.

Excavation

If the ground is firm enough to stand with vertical faces when excavated to the required depth, construction will be simplified, as the ground can then be used for the outer form when placing concrete. In this case a template made to suit the outer dimensions of the tank should be placed in position at ground surface and levelled. With this in position the four sides of the excavation can be carried down to the exact size and quite vertical by using a level or plumb-bob. The bottom should be neatly trimmed to the exact size and made level, sloping, or level but with a sump at one end as desired. Trenches for the inlet drain and outlet pipe should be trimmed to the required size and level adjacent to the tank excavation.

If the ground is not stable enough to stand satisfactorily during excavation, a hole should be excavated with its bottom dimensions larger than the outer dimensions of the tank and the sides suitably sloped back, and it will then be necessary to construct outer wooden forms as well as inside forms. In this case when the tank is completed earth should be filled round the sides of the tank and well rammed. Where the top is below ground level filling should be placed over the completed tank up to the original



ground level, or a little higher to allow for settlement. It is desirable to have the top of the tank slightly above ground level, and it is worth while extending the walls upward where necessary to achieve this.

Formwork

The erection of formwork is not difficult for anyone used to handling tools. If the site of the tank is in firm ground, the earth can be used as the outer form, but for a site excavated in soil which will not stand vertically both inner and outer forms will be required. Care must be taken to ensure that the inside forms may be removed fairly readily. The forms can be dismantled inside the tank by drawing all partly-driven nails holding the boards in place and then the boards can be freed one at a time and removed from the tank. Of course the frames for bracing and levelling the forms will have been removed before this.

The inlet and outlet glazed earthenware tees can be readily fixed in place in the forms. The boards for the forms should be of 1in. timber and preferably dressed both sides, as the smooth boards and uniform thickness will help to ensure a smooth interior, which is most desirable. Before placing concrete the sides of the forms which will be in contact with concrete should be painted over with old engine oil to prevent the concrete adhering to the timber.

Reinforcement

Though reinforcing of the floor, walls, etc., is not essential unless the ground is very soft, and it may be omitted except in the loose cover slabs and in the top slab, it is desirable that some steel should be placed in the tank walls and floor. The easiest method of reinforcement is by the use of welded wire mesh reinforcement (14-gauge wire with 2in. square mesh would be suitable) bent to the required shapes. If a sump is incorporated in the tank, mesh reinforcing for it may be bent in the same way.

The floor mesh can be placed by pouring and roughly smoothing the lower half of the thickness of the floor, placing the mesh on it, and then pouring the upper half and screeding to a level surface. These operations should, of course, be continuous. This will leave 6in. of turned-up wire mesh projecting from the floor on the centre lines of the walls. The wall mesh should be stood on the floor and be tied with wire at intervals to the wire projecting from the floor. The laps of wire mesh at the ends of the tank should also be tied at intervals. The wire mesh in the walls must be placed so that it will be in the middle of the wall thickness, and a watch must be kept during pouring of the concrete to ensure that the wire is not pushed against the forms.

Concrete

Bulletin 184, "Concrete on the Farm," obtainable free from any office of the Department of Agriculture, explains the essentials in making sound concrete, and should be consulted by anybody not familiar with mixing and procedure before construction of a septic tank is attempted.

Effluent Disposal

To avoid the cost of excessive lengths of piping it is necessary to dispose of the effluent from the septic tank reasonably close to the tank and without creating a nuisance or causing pollution of streams or water supply.

Foul septic tank effluent should never be discharged direct to a stream. Underground soakage and purification in a sub-surface disposal field in which the effluent flows through a system of open-jointed drainage pipelines or other approved system are the best means of disposal.

The sub-surface disposal field should be located at least 100ft. from any water supply well (downstream if the direction of flow can be ascertained), 25ft. from any stream, and 30ft. from any house or 15ft. from any boundary.

If it is proposed to locate the disposal field close to any source of water supply, the advice of a Health Department inspector should be obtained.

A distribution box is very desirable to divide the flow between two or more lines of tiles and serves also as an inspection manhole for checking the quality of the effluent. The box, which should be at the higher end of the distribution field, should be connected to the septic tank by a short, mortar-jointed sewer line 6in. in diameter. The inlet pipe should enter an end of the box about 2in. above the bottom. The sides of the box should extend to within 6in. of the surface and be fitted with a removable cover. The outlet pipes should have their inverts (bottoms of insides of pipes) at box floor level at exactly the same level. The box may be not more than 18in. in width and no longer than necessary to fit in all the outlet pipes. Any outlet can be readily blocked at the box when required. As it is desirable that the cover of the box should be slightly above ground level, it is worth making the box deeper than otherwise necessary to achieve this.

The layout of the disposal field, the length and number of laterals required, grades, etc., require some consideration if the field is to work satisfactorily.

Test to determine length of tile necessary: The porosity of the soil will have a great effect on the length of tile lines needed in the disposal field; the more porous it is the shorter need be the length of tile, while the heavier it is the longer will be the tile lines needed and the more difficult it will be to dispose of the effluent.

A simple test of the absorptive capacity of the soil, quoted from American authorities, can be carried out as follows:—

Excavate a hole 1ft. square and to the depth of the proposed disposal trenches (in most instances this will be about 24in. and should not exceed 36in.). Put water into the hole to a depth of at least 6in. and allow it to seep away. (Judgment is required in determining how soil conditions at the time of the test vary from the average of those throughout the year. If the soil appears exceptionally dry or conditions suggest that its absorptive capacity at the time might be abnormal, greater depths of water may be used or the test may be repeated. In no case should tests be made in filled or frozen ground, nor will tests be of much use in fissured soil.) The time in minutes required for all the water to seep away divided by the depth in inches of the water placed in the hole gives the average time required for the water to drop 1in. With this information the effective length of tile line required for the average farm homestead may be determined from Table 2 on the next page.

It is desirable that this simple test should be carried out wherever possible. Without it a rough guide would

TABLE I.

Maximum No. of People Served	Liquid Capacity of Tank in Galls.	Inside Dimensions (neglecting plaster)				Materials for 1:2:4 Concrete												
						Walls 4½" Thick				Walls 6" Thick				4½" Floor with Brick Walls				
		Width	Length	Liquid Depth	Total Depth	Cement Bags		Sand Cu.Yds	Metal Cu.Yds	Cement Bags		Sand Cu.Yds.	Metal Cu.Yds.	Cement Bags		Sand Cu.Yds	Metal Cu.Yds.	No of Bricks
						124½lb.	94lb.			124½lb.	94lb.			124½lb.	94lb.			
6 or less	300	2'4"	7'3"	3'0"	3'9"	9	12	0·8	1·5	12	16	1·1	2·1	3	4	0·3	0·6	395
8	400	2'6"	8'4"	3'3"	4'0"	10	13	1·0	1·8	14	19	1·3	2·5	4	5	0·4	0·7	480
10	500	2'8"	9'0"	3'6"	4'3"	11	15	1·1	2·1	15	20	1·4	2·8	4	6	0·4	0·7	545
12	600	2'10"	9'6"	3'9"	4'6"	13	17	1·2	2·3	17	23	1·6	3·1	5	7	0·4	0·8	605

Note: 124½lb. bags have been standard size, but 94lb. bags are now being introduced.

be to lay 30ft. per person in dry sandy or open porous soils, 50ft. per person in more compact but still porous soils, and up to 100ft. per person in some tight clay soils. Some preliminary preparation of the soil in the trenches, especially in clay soils, may be necessary.

Layout of disposal field, construction, grades, etc.: Three inches should be the minimum diameter of tiles used for the laterals, and 4in. is preferable. If glazed socket and spigot drainpipes are used, they should be laid with a ½in. space between the joints and with sufficient mortar at the bottom of the joints to ensure an even flow line. However, the use of glazed socket and spigot drainpipes would usually prove rather expensive, and agricultural field tiles will prove quite satisfactory.

The pipes leaving the distribution box and extending as far as the laterals, including necessary bends, should be glazed drainpipes and the laterals of field tiles. These field tiles should be laid with open joints of ¼in. to ½in. and the upper half of the joint should be covered with a strip of building paper or similar material large enough to be readily held in place while the tile is being covered. Covering of joints of the glazed drainpipes is not necessary.

The laterals should not be laid on grades steeper than 6in. of fall in 100ft., and between 2 and 4in. per 100ft. is generally better.

The width of the bottom of the trench is important, as this provides the area necessary for absorption. The minimum width should be 18in. and the less porous the soil the wider the trench should be. Table 3 gives size and minimum spacing requirements for trenches.

The filter material used round the tiles in the trenches should be clean gravel or crushed stone ranging in size from ¾in. to 2½in. To obtain an accurate grade for the field tiles they are best laid on a grade board previously set in the trench with the top edge true to grade. If stone is put in the trench to the top of this board, the tiles can be placed by hand on the top edge of the grade board and held properly in line by stones placed at their sides. The stones should then be filled over the top of the pipe to a depth of a few inches and covered with a layer of straw about 2in. thick to prevent the earth backfill from running down into the stone. Backfill on the top of the stone should be well compacted and heaped a little above ground level to allow for settlement.

If the disposal field is in a paddock or garden, the depth of earth backfill must be greater than the depth to which it is ever likely to be worked by cultivating implements.

TABLE 2

Nature of soil	Time required for water level to fall 1in. minutes	Total length of tile lines required ft.
Clean coarse sand or gravel	Should be less than 2	75
Fine sand or light loam	„ „ „ „ 10	100
Fine sand with some clay or loam	„ „ „ „ 30	150
Clay with some sand or gravel	„ „ „ „ 60	400

If in heavy clay the water takes over 60 minutes to disappear, the area may be considered unsuitable for the installation of disposal tiles.

TABLE 3

Width of trench at bottom in.	Depth of trench in.	Minimum spacing for tile lines ft.	in.
18	18 to 30	6	
24	18 to 30	6	
30	18 to 36	7	6
36	24 to 36	9	

On flat country the disposal field may be laid out in various patterns. On sloping ground more care in location of the tile lines is required. Some of the drains from the distribution boxes may run down the slope to the lines of the laterals, but the laterals will be generally along the slope, as the grades of tile lines are flat. There are a number of arrangements which could be adapted to suit the particular site.

Sub-surface Filter Trench

If the soil is very heavy and sub-surface soakage cannot be obtained, a sub-surface filter trench will effect some further purification before discharge of the effluent. Such a system may involve discharge to a watercourse, and the approval of a Health Department inspector should be obtained before constructing this type.

The sub-surface filter should be located at least 100ft. downstream from underground water supplies and should preferably be constructed a little distance away from the septic tank. For a single dwelling the length should range from 50 to 75ft., depending on the number of occupants.

Glazed socketed pipes are better than field tiles for the upper pipes, as they are not so easily thrown out of alignment by settlement of the bed. The lower drainage pipes should be field tiles of 4in. diameter laid on the bottom of the trench. The sand must be clean and of a fairly coarse, uniform size. If suitable sand is not available, a very fine pea gravel or crushed stone may be used. If the septic tank is not attended to and the solids are not settled out properly, the drains and filtering material will become clogged and the filter will be of little use in a short time.

Operation of Septic Tanks

The tank should be inspected every few months and the depth of sludge and scum should be measured through the inlet pipe. If the depth of scum is too great, it should be broken up by hosing or by pushing it down into the liquid, or it may be removed and buried.

Sludge should be removed whenever the depth exceeds about one-third of the total depth of the contents of the tank. It is essential that the whole of the sludge should not be removed, as this would leave none of the bacteria necessary for starting the digestion of solids deposited after cleaning the tank.

The sludge is most easily removed by pumping, and it is preferable to remove only the digested sludge from near the floor of the tank, as this is usually relatively free from odour. Freshly-deposited sludge should remain in the tank for digestion. A diaphragm pump with a vertical pipe inserted through the vertical part of the inlet pipe down to the sump in the floor of the tank would readily remove the digested sludge.

Where the ground slopes away from the tank removal of the sludge is facilitated by the installation at one side of the tank at floor or sump level of a sludge outlet through which it can be discharged by water pressure through a line of drainpipes to trenches where it can be buried. The flow of sludge is started by opening the sluice valve or other simpler type of valve.

Systems for Groups of Houses

For one or two houses the septic tank is all that can normally be considered, but for groups of farm houses, dairy factory villages, etc., there are several other methods of treating sewage which are of a much higher standard than the septic tank method. In one of these systems sewage passes first into an Imhoff tank (sometimes a septic tank in very small installations) in which settling of solids and digestion of the sludge are more satisfactorily accomplished; then after the effluent has been sprinkled on a filter bed of large stones it passes through a final settling tank. These plants can produce effluents of a high standard, provided maintenance is adequate.

It should be appreciated, however, that the type of treatment plant is determined by the standard of purity of the effluent which can be discharged into a stream during low summer flow without causing harmful pollution. If the stream into which the effluent discharges is used for bathing or water supplies, chlorination of the effluent will be necessary. The amount of chlorine used to sterilise the effluent from such a complete treatment plant is much less than would be required for the effluent from a septic tank of similar capacity.

The illustration at the bottom of page 51 shows such a small community plant, several of which are being built in this country now.

Acknowledgments

In preparation of this article much use has been made of excellent publications of the United States Government Public Health Service and Department of Agriculture and the Ohio State Department of Health. Another useful reference of which use has been made is an English book, "Sewage Disposal from Isolated Dwellings," by G. M. Flood. Acknowledgment must also be made of the assistance given by the New Zealand Department of Health.

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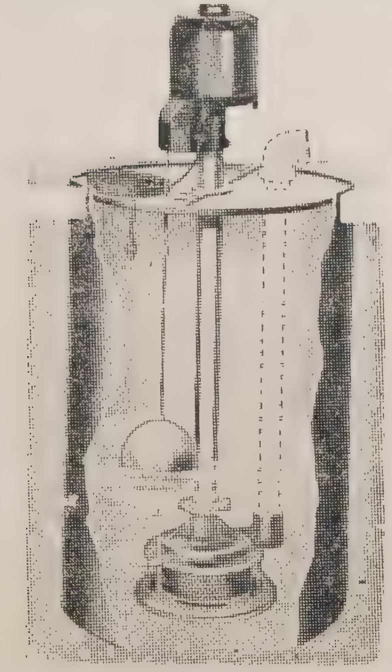

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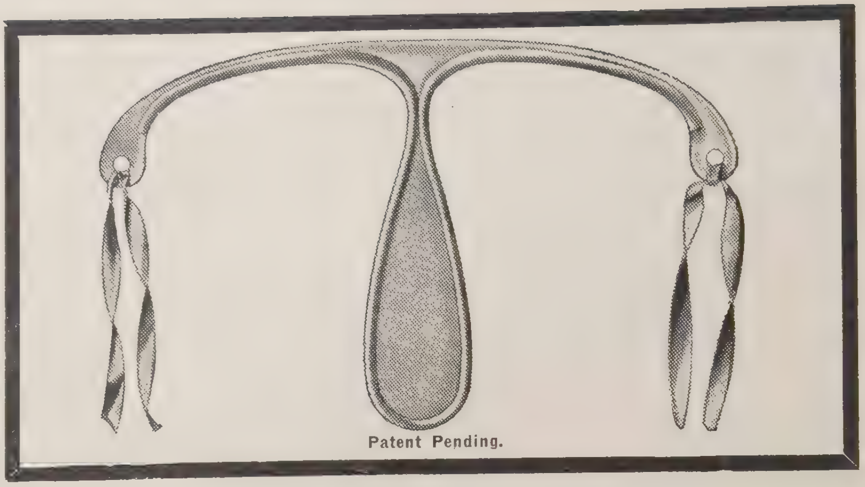

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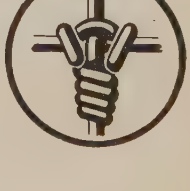

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TUBERCULOSIS IN POULTRY

A COMMON cause of loss to poultry keepers is tuberculosis. As the disease is slow and insidious, and usually is not accompanied by a sudden heavy death rate, its effects are not always as obvious as those of other conditions. Nevertheless, it can cause heavy losses. In this article A. C. Howse, Poultry Veterinary Officer, Department of Agriculture, Wellington, describes the symptoms of the disease and the steps to be taken to check it.

THAT tuberculosis occurs in many species of animals, including man, is well known, but the fact that the disease occurs in birds as well as mammals is perhaps not so widely understood. It has been found in sparrows, parrots, pheasants, and turkeys and is extremely common in the domestic fowl. Ducks and geese are said to be susceptible, but as they are rarely found affected under ordinary field conditions, they can be regarded as more resistant than other poultry.

Tuberculosis in all species is a slow, insidious, chronic disease. Acute or rapid cases are comparatively rare and in animals occur when widespread affection of the lungs results from the breakdown of a damaged area, or "lesion" as it is called, in another part of the body, with the result that large numbers of the germs causing the disease are carried by the bloodstream to the lungs. This occurs fairly frequently in cattle, but rarely, if ever, in fowls, in which species infection of the lungs is extremely uncommon.

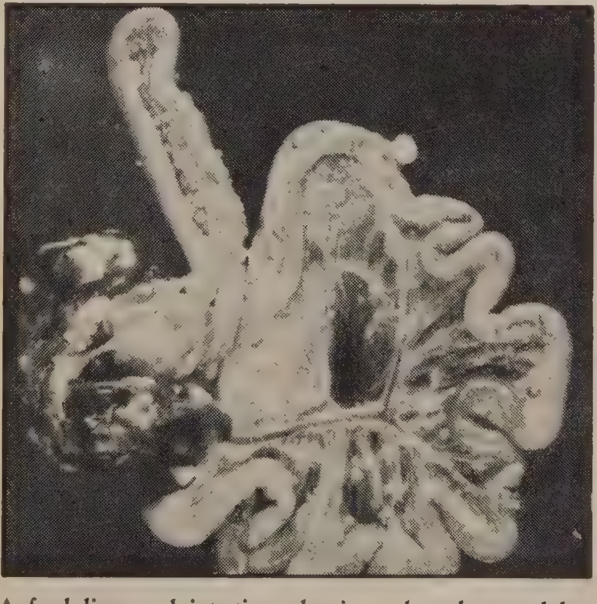
The disease is infectious within all susceptible species, though it does not necessarily follow that it can be transferred from one species of animal to another; this is sometimes the case, but not always. It is caused by a minute, elongated, slender organism known as *Mycobacterium tuberculosis,* or the tubercle bacillus. This organism is classified as belonging to the bacteria because it is visible to the naked eye when sufficiently magnified and is too large to pass in liquid suspension through the pores of certain unglazed porcelain filters. Though larger than the type of organism known as a virus, nevertheless it can be seen only with the aid of a microscope sufficiently powerful to magnify it about 900 times.

There are three strains or types of the tubercle bacillus, known as the human, bovine, and avian strains. The bovine strain, so called because it most commonly affects cattle, is generally regarded as the most powerful or virulent. It readily affects humans as well as cattle. Many cases in children, who are particularly susceptible to this disease, can be traced to the consumption of unheated tuberculous milk—that is, milk produced by cows affected with tuberculosis of the udder.

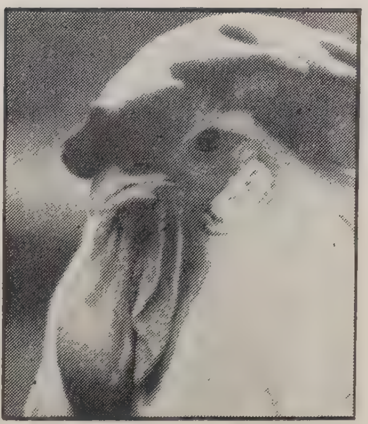
The avian strain is not regarded as virulent for most mammals, though in a case reported recently tuberculosis in a human apparently was caused by the avian form of the organism. However, such instances are rare and there is little evidence that tuberculous fowls are a danger to public health.

Cattle are susceptible to avian tuberculosis, but in this species the disease, if of poultry origin, is not progressive. Calves or young cattle running in direct or indirect contact with tuberculous fowls may fail to pass a tuberculin test, but post-mortem examination of such cattle rarely, if ever, reveals extensive lesions or damage resulting from the disease. Such lesions as may occur eventually become walled round and shut in, causing no wasting or other loss of health. However, the fact that, in the early stages of infection at least, the cattle concerned may fail to pass a tuberculin test should be borne in mind by dairy farmers whose herds run in contact with poultry and who may consider having them tested.

Pigs, on the other hand, are highly susceptible to avian tuberculosis, and poultry are equally likely to become infected by tuberculous pigs. For this reason pigs and poultry should not be allowed to come in contact with each other.



A fowl liver and intestines showing tuberculous nodules.



A fowl which has given a positive reaction to a tuberculin test administered 48 hours previously. Tuberculin was injected into the right wattle, which is now enlarged.

Symptoms of Disease

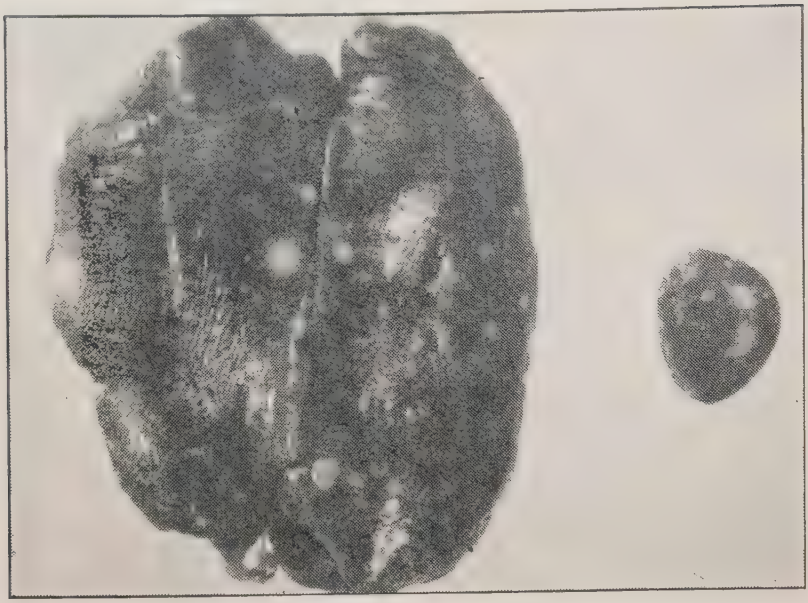
In fowls the disease causes a progressive loss of condition, wasting, emaciation, and finally death. Diseased birds tend to mope about in the vicinity of the house. The appetite varies and may be good. Affected birds may not look in poor condition, but when picked up and handled they are found to be far below normal weight. Because of the wasting of the breast muscles, the breastbone may feel so sharp and prominent as to resemble in shape the keel of a yacht. There are also, as a rule, paleness and shrinkage of the comb and wattles such as occur when fowls are out of production for any reason.

A characteristic but less-known symptom of tuberculosis in fowls is lameness, caused by affection of the joints by the infecting organism. Loss of condition and poor production, accompanied by occasional deaths and cases of lameness in a flock of hens should always be regarded with suspicion.

Most poultry diseases affect mainly the younger stock, because older birds develop immunity after recovery from mild attacks, but that is not the case with tuberculosis, against which there is no immunity at any age. In most cases infection probably occurs when birds are young and generally is followed by a long incubation period, so that symptoms are apparent in birds of from 12 to 18 months and older.

The disease in fowls differs from that in humans and cattle in that in the latter two species it is frequently a disease of the lungs and associated organs, infection being spread by breathing and coughing, whereas in poultry it is essentially a disease of the digestive organs, involvement of the lungs being extremely rare. It is purely a ground infection, spread from bird to bird through infected droppings. In pigs, which are

TUBERCULOSIS IN POULTRY



Liver and spleen from a tuberculous fowl, showing yellow diseased areas.

particularly susceptible to infection with the avian strain, the disease also occurs mainly in the glands associated with the digestive tract.

Post-Mortem Evidence

The post-mortem changes or lesions are all associated with the digestive organs. If the carcass of a tuberculous fowl is opened and examined, the most striking change is found in the liver. This organ will contain numerous small yellow areas throughout its substance, in size generally somewhat smaller than that of a pea, though size varies and lesions tend to join. A similar appearance will be observed in the spleen, and generally both these organs are enlarged.

The intestine should next be examined. In most cases small nodular growths appear at irregular intervals along the outside of the gut, indicating the points at which the infecting organisms, picked up from the ground and swallowed, have entered through the internal lining of the intestine. The growths represent inflammation and proliferation of the tissues in an effort to combat the invasion. Organisms are carried from there to the liver in the blood-stream, causing the striking changes in the liver. If lesions from intestine or liver are examined microscopically, they are found to be teeming with tubercle bacilli. There are also changes in the bone marrow, but these are less obvious and farmers will not need to look so far.

Tuberculin Testing

Tuberculosis of poultry is purely a ground infection, spread from bird to bird through the swallowing of tubercle bacilli in infected droppings. It is a serious condition, causing much economic loss through lowering of production and condition and through deaths of affected birds. However, the cause and mode of spread being well understood, adequate means can be devised for dealing with it.

Where a flock is found to be infected, as a first step all the birds should be gone through and handled, and all obviously "light" birds should be killed and their carcasses burnt. The remainder should be subjected to the tuberculin test, which is performed by injecting a few drops of a preparation known as tuberculin into the skin of one wattle and 48 hours later comparing it with the other. In tuberculous birds a swelling appears where the injection has been made; there is no change in birds which are not affected. The test can be carried out only by a veterinary surgeon. Arrangements can generally be made for it to be performed, when required, by a Veterinarian of the Department of Agriculture, in co-operation with the Poultry Instructor.

All "reactors to the test," as birds which fail to pass are called, should be removed and destroyed, and the remainder shifted immediately to clean houses with fresh, unused litter and, if running out, to fresh ground which has not carried tuberculous birds before. It is absolutely useless to tuberculin test birds and leave those which do not react in the same runs and houses, as they are certain to pick up ground infection sooner or later, and a subsequent test would probably reveal as high a proportion of reactors as before.

Treatment of Houses and Runs

After the infected houses have been vacated they should be well soaked inside with an approved disinfectant in appropriate strength, and the manure and litter in them should be removed from all possible contact with poultry. Perches, droppings boards, and all interior fittings should be well scrubbed with disinfectant and scraped, and the scrapings swept out and burnt. The house should then receive a final spraying with disinfectant.

Usually disinfecting runs and pastures by ordinary means is impracticable, and infected ground should be kept free of poultry for at least 12 months. Drying and sunlight have a potent lethal effect on most bacteria, including the tubercle bacillus, so the grass should be kept short to enable the light to reach all the ground surface. This can be effected either by cutting or by grazing with sheep or goats, which appear to be resistant to tuberculosis, but not with either cattle or pigs, which might carry on the infection.

In addition, the land can be dressed with quicklime at the rate of 2 tons to the acre, and the area immediately around the houses, where infection is likely to be most concentrated, should be well sprayed with disinfectant. If it is intended to use it again for poultry after the 12 months have elapsed, the ground should not be dug or ploughed, as burying the infection protects it from sunlight and helps to keep it alive.

Tuberculosis does not appear to be very common on purely-poultry farms in New Zealand, but where it does exist it can cause considerable loss and should be dealt with energetically. However, it is a very common disease of farmyard poultry where birds run loose over the same ground year after year on general farms. In such circumstances once infection is introduced it soon builds up and remains as long as fowls are kept on the infected land. The most satisfactory remedy where losses are heavy in such cases probably is to eliminate existing stocks and start with a new lot of young birds, keeping them wired in on fresh ground, though good results are reported in some cases where birds on infected land on general farms are kept only for the pullet year of lay, a new lot of young stock being bought each year. The principle underlying this method of control is that the birds do not remain on the farm long enough for the disease to develop, though some loss probably occurs, as a proportion of cases is found in birds younger than 18 months.

If Tuberculosis is Suspected

To summarise, if a farmer suspects this disease in his flock, the following steps should be taken:

The existence of tuberculosis should be definitely established. In doubtful cases a Veterinarian or Poultry Instructor of the Department of Agriculture should be asked to assist, and, if necessary, suspected live birds or carcasses can be sent to the Chief Diagnostic Officer, Wallaceville Animal Research Station, Private Bag, Wellington, with a letter giving the name and address of the owner and full particulars of the outbreak.

If the disease exists, the flock should be culled and then tuberculin tested, and reactors should be destroyed.

The remainder of the flock should be removed to clean land and houses.

Infected houses should be disinfected and land kept clear of poultry for at least 12 months.

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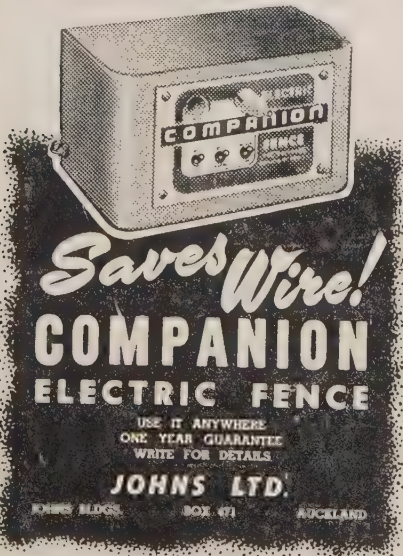

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SEED PRODUCTION IN NEW ZEALAND

White Clover

By C. C. LEITCH, Assistant Fields Superintendent,
Department of Agriculture, Christchurch.

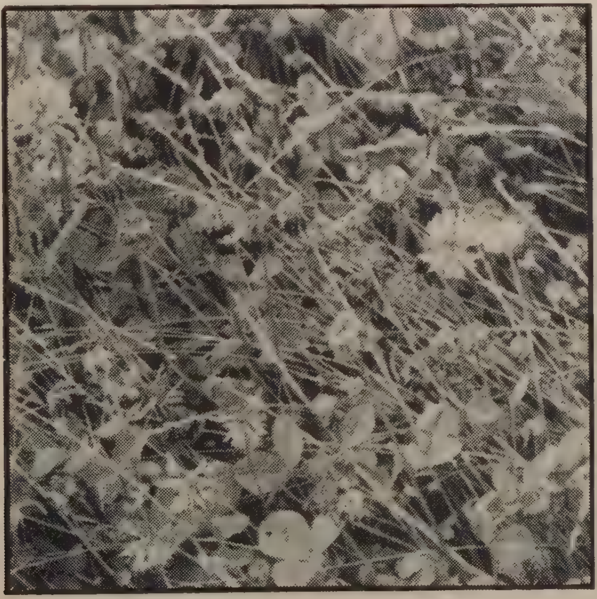
WHITE CLOVER is the most important species in pasture production in New Zealand. Its ability to grow on a wide range of soil types makes it a very valuable clover, and very few seed mixtures do not include it. Its response to dressings of phosphatic fertilisers and its ability to draw on and consume nitrogen from the air make it an ideal plant for use in almost all pasture-improvement programmes. In addition to the stimulus which it can give to the grasses in the sward, white clover itself makes a valuable and direct contribution to the total production of the pasture.

THE characteristics of white clover (*Trifolium repens*) are overground runners, which root at the nodes to form new plants; hairless leaves and stems, and short stipules. The large-leafed form is sometimes confused with red clover, but they can be distinguished readily by the hairiness of red clover. Strawberry clover is very similar to white clover, but differs in that the leaflets are dark green and oval. White clover can be distinguished readily from alsike clover by its shorter stipules.

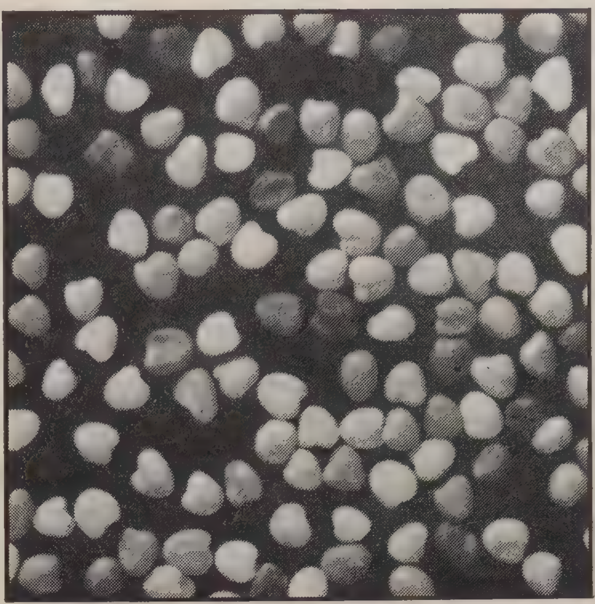
The seed is heart-shaped and it can pass through cattle uninjured and germinate freely in the dung. The plant is a perennial, and its ability to spread by means of the runners makes it very valuable in any field, because it soon fills up the bare spaces and gives a good cover to the soil.

Place in New Zealand Farming

White clover has a most important place in New Zealand farming. It is the keystone on which pastoral production in New Zealand is based, and in its absence difficulty is experienced in keeping up production. Because of its ability to grow under a wide range of conditions it is included in almost all seed mixtures for both plains and hills in most parts of the country. Being a legume, it is able to increase the nitrogen content of the soil.



A white clover seed crop, nearly ripe.



White clover seed (five times natural size.)

Conditions which are not suitable for its growth are those on undrained swamps, very light shingly soils, and soils of very low fertility. On some of the tussock area where it would not be expected to grow, white clover is occasionally observed to be flourishing. It frequently grows on clay banks and clay knobs on downs country.

History of Seed Production

White clover seed has been harvested in New Zealand for 60 to 70 years, but from figures available it would seem that for some years the acreage harvested ranged between 2000 and 3000 for the whole country. This can be accounted for by the fact that white clover seed could be imported at a price to compete with the locally-grown product, and farmers were not aware of the great benefits to be derived from the use of an approved strain of white clover in their pastures. The main areas producing seed then appear to have been parts of Hawke's Bay, Canterbury, and Southland. The areas in Hawke's Bay and Southland were small, with the bulk of the seed grown in Canterbury and Marlborough.

The saving of white clover seed has been revolutionised in recent years. With a widening appreciation of its value in a mixture, the demand for seed in New Zealand has increased, and the export market has also developed, particularly for Certified seed, as a sequel to the results obtained overseas with the better New Zealand strains. Expanded production has been aided by the adoption of the header harvester to replace the clover huller in threshing the crop. In this way the harvesting of the seed has been made much simpler, involving less risk of crop loss and enabling larger areas to be handled with less labour.

White clover for seed production requires a climate that is dry during the latter part of December and January. In such conditions harvesting of the crop presents little difficulty, but for good crops reasonable rains are needed in autumn, winter, and spring to promote the necessary growth for cutting. Soil types vary considerably on areas that have been harvested for seed. In some seasons the heavy silty loams give excellent crops, but if rain falls in December or January, these areas are suitable only for hay. The medium silty loams of the Canterbury Plains are probably the most suitable for seed crops. On the lighter soils good crops are obtained in seasons when crops on the heavier soils are ruined because of too much moisture. Yields of 100 to 150lb. per acre have been obtained from land worth £5 per acre. As white clover is included in almost all seed mixtures, and by

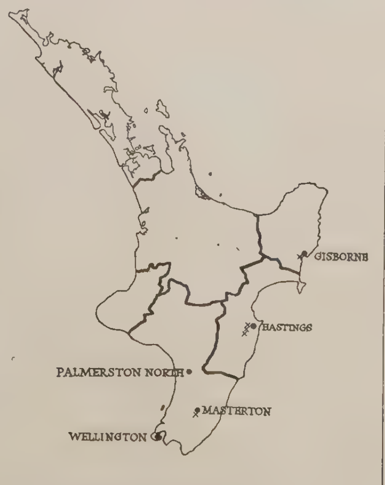
ACREAGES OF WHITE CLOVER HARVESTED FOR SEED BY LAND DISTRICTS

Year		North Auckland	Auckland	Gisborne	Hawke's Bay	Rest of North Island	Nelson	Marl-borough	Canterbury	Otago	Southland	Total
1927-28	..			10	5	27	12	228	1,691	138	183	2,294
1928-29	..			15	18	15	3	355	2,554	197	181	3,338
1929-30	..			7	95	1	16	409	2,257	475	450	3,710
1930-31	..	40	11	29	96	39	35	285	2,223	157	424	3,339
1931-32	..		2	54	14	24	1	252	1,017	583	476	2,423
1932-33	..			114	104	84	21	287	2,430	910	410	4,360
1933-34	..			250	250	140		373	2,975	1,659	1,051	6,698
1934-35	..			190	275	124	2	449	6,655	1,583	1,014	10,292
1935-36	..		9	159	75	180	28	568	1,848	1,812	1,905	6,584
1936-37	..	30		78	293	46		582	5,123	1,810	1,275	9,237
1937-38	..		7	14	101	57		195	3,306	596	524	4,800
1938-39	..			40	260	76		251	4,455	1,120	980	7,182
1939-40	..			186	720	89		73	3,369	2,051	2,353	8,841
1940-41	..	12	4	303	2,244	114	31	634	8,036	3,517	5,246	20,141
1941-42	..	11		115	1,147	303	7	757	10,813	4,877	7,483	25,513
1942-43	..			62	355	96	16	680	15,650	4,654	4,847	26,360
1943-44	..			81	344	106	34	532	9,369	2,389	2,130	14,985
1944-45	..			125	1,438	307	59	1,311	14,042	3,202	3,112	23,596
1945-46	..			96	65	366	146	1,555	31,323	6,136	3,764	43,451
1946-47	..			280	564	1,183	178	1,221	34,068	4,870	5,590	47,954

management can frequently be made the dominant constituent, most areas in country not too broken or steep and with a favourable climate can be considered potential seed-producing land.

Sowing Methods

Of late some farmers have sown special paddocks in white clover alone for seed production, but this is by no means the general practice. In areas more suited to seed production there has developed a system of sowing a simple mixture of 20 to 25lb. of perennial ryegrass and 3 to 4lb. of white clover with the aim of harvesting both for seed in successive years. The pasture is so managed that in the first season perennial ryegrass is harvested. That necessitates a more lenient type of grazing in early spring to keep the white clover in check, though on most occasions the amount of white clover in the sward in the first harvest does not present a problem. In the second harvest the area is managed to suit the clover, involving much heavier grazing in spring to keep the ryegrass in check and encourage the clover to take charge, which it usually does. Under this method two crops are harvested at their peaks of production. The mixture is either broadcast or drilled, depending on climate and situation, the drill being used where conditions are dry at the time of sowing.



The crosses indicate the districts of the North Island where white clover is harvested for seed.

Where seed production is the aim seed is usually sown after a summer fallow, and this method has much to recommend it. In other cases it may be sown with a rape crop or broadcast on a wheat, oat, or linseed crop. When the seed is sown with a crop the strike usually is poorer, but some heavy yields have been obtained from stands sown in a crop in spring. White clover sown in autumn does not produce a great deal in the first season unless the weather is exceptional; the best crop is usually obtained at the second harvest. If sown in spring under a cover crop, white clover will give a good crop of seed the following harvest—that is, in 15 to 18 months. For establishment either spring or early-autumn sowing is satisfactory.

Fertiliser Requirements

It has become very evident during the past 10 to 15 years that one essential for clover growth is the application of lime and phosphate.

If lime has not been applied previously, at least 1 ton per acre is required, either worked into the soil before the crop is sown or, if the area is autumn sown, applied when the clover has become established. A dressing of 1 to 1½cwt. of superphosphate should be applied when the seed is sown. On very fertile soils these amounts may not be necessary, but for good clover growth lime is essential; instances are known in which without lime no clover has grown, but with liming up to 1½ to 2 bags of seed to the acre have been obtained.

If phosphates are used on established areas, their application is preferable in early autumn rather than in spring. If phosphates are applied in spring, growth tends to be bulkier at a time when it is not required and the flowering period is likely to be extended, with consequent loss of quality in the seed.

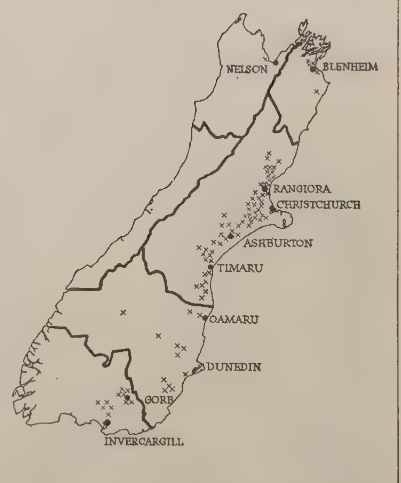
Management of Seed Areas

The management of an area to be saved for seed aims at having the clover plants growing vigorously and with strong root development. The foliage growth is kept under control by grazing until the flower heads begin to appear, when the plants spend their energy in seed production rather than leaf production. This behaviour is accentuated where the supply of moisture in summer is not liberal, but in wetter districts and seasons the improved strains of white clover will continue to produce abundant foliage and smother the flower heads.

The ideal treatment is to control the growth in autumn by reasonably-close grazing; the area should be grazed to about ½in. as evenly as possible, this growth allowed to recover, and then grazed again, leaving about ½in. of growth to go into the winter. If some growth is made during winter, it can be fed on the rationing system—about an hour a day for either cattle or sheep. In spring the area should be grazed closely during the flush and kept reasonably short until about the middle to the end of October, or even into November in some seasons, depending on the situation. In general the area should be closed for a seed crop when the first flower heads begin to appear.

The soil type has some influence on the length of time for which the land can be grazed. Areas on good clover land with a good supply of moisture can be closed later than those on the light plains land. Land is better closed up too soon than too late; if growth becomes excessive, the area can be grazed again, but if it becomes dry and the area has been grazed closely, a reduced yield or no crop is likely. Cattle probably are better than sheep for the final grazing, as they are unlikely to graze too closely; if not managed carefully, sheep will spoil a potential crop by over-grazing. After the area has been closed for seed no other treatment is required until harvest.

Where irrigation is available the treatment is somewhat different, as water is on hand at all times. The area



The crosses indicate the districts of the South Island where white clover is harvested for seed.

HARVESTING OF WHITE CLOVER SEED

A crop of white clover in full flower closed for seed production at Highbank, Canterbury.

is closed later, and just before that water is applied; a further application is given if the weather is such that the plants show signs of wilting. The main objective is to get full flowering without so much moisture in the soil that second growth is produced at a time when the bulk of the crop is beginning to ripen off.

Ideal weather for harvesting is hot and dry without heavy winds to scatter the cut material. Rain is not welcome after the crop has been cut because usually it causes second growth, which comes up through the cut material and makes drying impossible. A fortnight to 3 weeks' dry weather starting between the middle of December and the end of January, depending on the district, would be ideal for the harvesting of white clover seed.

The time to cut clover for seed is very difficult to gauge, as flowering takes place over a long period. There are often three flowerings depending on the weather, with the bulk of the crop in full flower about the last week in November or the first week in December. The crop is cut when at least three-quarters of the flower heads are ripe and mature seed can be rubbed out in the hand, with the balance of the flower heads ripening off and the seed beginning to change colour. The number of seed heads that are really ripe is the guide to the stage at which to cut the crop, not the number of flower heads showing. As the crop ripens the ripe heads droop over, and unless the crop is examined closely, its condition cannot be assessed. White clover, unlike ryegrass, will stand for a reasonable time even after ripening without coming to a great deal of harm. Where high winds are a problem the crop is left until it is dead ripe, which means that probably it can be cut one day and threshed the next.

A white clover crop maturing in the windrow.

Methods of Harvesting

In the past the crop was cut with a mower, the swath allowed to dry out, and a side rake or hay rake used to draw the crop into windrows. From these it was either carted to stack or directly to the clover-hulling machine for threshing. If clover was stacked, it was not always possible to thresh immediately, which meant covering the stack to make it reasonably waterproof. All this handling involved loss of seed, but now with practically all harvesting done with a header harvester the crop can be left until ripe, cut, and threshed without any other handling.

The crop is cut with a mower, usually with a 5ft. cutter bar, and two shedder boards draw the swath in to the approximate width of the header. If a cutter bar longer than 5ft. is used, more material has to be drawn in and this slows up the drying of the crop. The density of the crop and the type of header to be used govern the length of the cutter bar.

The weather at the time of threshing is important, as attempting to thresh the crop when the material is clammy will cause serious losses. For ideal threshing conditions the heads should be brittle and a cloud of dust should issue from the back of the machine.

Consultation with the manufacturer's agent to ensure correct settings is highly desirable if a good product is to be obtained. Various types of machines are available, but they will all do a satisfactory job if the crop is fit and proper attention is paid to the speed and setting of the drum.

QUANTITIES OF WHITE CLOVER SEED CERTIFIED (lb.)

District	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39	1939-40	1940-41	1941-42	1942-43	1943-44	1944-45	1945-46	1946-47
Auckland ..									19,400										
Waikato ..										2,500									
Poverty Bay ..			5,137		526		8,915	1,584	3,326	6,786	11,611	10,064	34,075	12,593	9,317	4,446	18,620	19,904	34,464
Hawke's Bay ..		13,274	37,515	1,911	21,198	15,370	17,730	3,279	63,214	42,748	53,871	126,023	185,048	119,245	57,700	66,842	301,123	52,520	120,598
Wanganui ..													1,200					167	33,147
Manawatu ..							5,120	1,013	34,856	7,329	4,516	10,006	15,951	10,287	22,548	30,584	7,289	34,834	44,281
Wairarapa ..							688	1,171	442	4,131	6,942	1,388	13,380	1,805	12,917	200	17,474	20,755	644
Nelson ..			566		92		112	608									1,352	5,759	5,810
Marlborough		268	5,337		3,690	588	4,537	5,718	19,190	10,818	22,373	4,339	26,846	69,032	60,870	58,134	55,180	129,381	152,817
N. Canterbury	25,401	63,015	16,344	4,219	8,612	2,403	53,752	32,720	244,647	17,948	25,220	29,777	60,135	63,193	150,135	95,867	198,536	408,743	417,616
Christchurch		Included in North Canterbury until 1936-37								222,264	234,305	209,081	526,148	559,636	679,715	690,481	605,843	1,473,597	1,264,566
Mid-Canterbury								1,223	15,420	3,970	6,780	1,093	32,869	35,705	75,426	84,767	118,130	358,005	368,420
S. Canterbury					36	224	432		11,269	5,274	39,996	17,582	147,832	180,064	374,471	312,574	171,791	785,373	578,837
Waimate ..		Included in South Canterbury until 1945-46																	41,619
North Otago ..							33		3,364	953	11,506	3,508	7,161	31,489	74,059	48,243	16,504	48,282	74,466
Central Otago			2,239				2,062	8,776						242	235			3,363	7,242
Maniototo ..		Included in Otago or Central Otago until 1936-37																2,185	
Otago ..									31,657	37,479	24,133	35,614	61,398	21,975	22,544	58,948	37,956	105,998	150,264
South Otago ..		Included in Otago or Western Southland until 1937-38																1,054	1,090
E. Southland		Included in Western Southland until 1935-36							6,511	7,845	1,013	18,362	76,763	49,196	80,834	58,787	39,797	89,250	24,996
W. Southland	1,600	4,514	104		958				7,634	35,185	1,209	16,941	45,951	36,177	52,150	48,200	34,710	89,365	109,025
Totals	27,001	81,071	67,242	6,130	35,112	18,585	93,381	56,092	460,930	405,230	443,445	483,778	1,234,757	1,190,639	1,672,921	1,558,073	1,624,305	3,628,535	3,429,902

Yields of white clover vary greatly from field to field, district to district, and season to season. Yields as high as 400lb. of machine-dressed seed per acre have been obtained, but yields of 100lb. or more may be considered satisfactory. Though the yield does not necessarily decrease as the pasture ages, other factors being equal, the best yield is obtained usually in the second harvest season following autumn sowing. High white clover seed yields from an area frequently alternate with low yields, and farmers endeavour to manage their stands accordingly, taking a seed crop in alternate years.

The presence of bees is also a factor in white clover seed production. Where they are present in sufficient numbers and the weather is suitable, a good setting of seed can be expected. The white clover seed crop is very susceptible to frost injury, and a frost of 5 to 6 degrees in late November can reduce the yield by half and may even spoil any prospect of a seed crop. In districts susceptible to frosts at that period of the year growers close their seed areas later; then if a frost does occur, damage is likely to be less.

The material removed in the machine dressing of seed from white clover-dominant stands averages from 30 to 40 per cent. of the line, depending on the season and the age of the pasture. Ribgrass and dock seeds are two of the main impurities, and these are difficult to separate from white clover seed. Another impurity of some consequence is suckling clover (*Trifolium dubium*); as seed of this species is of almost the same size range as white clover seed, it is very difficult, if not impossible, to remove during dressing.

Any area containing a high proportion of suckling clover is better abandoned for seed production. In certain seasons it is possible to get some measure of control by allowing the area proposed for seed production to get away in spring, cutting it about the end of October for a light crop of hay, and allowing the aftermath to run to seed. This reduces the yield somewhat and makes the harvest a little later, but usually it gives a crop of seed with a minimum of suckling clover.

Maintenance of Seed Pastures

The maintenance of white clover areas for seed production is not easy, and it is not a good practice to take seed from an area year after year. This has been done in certain favoured localities by the application of abundant lime and superphosphate, but white clover is a crop that can be planned only for the first or second harvest. After that the seasons take a hand, and often a crop appears "out of the blue" when one was not even contemplated.

Continued seed production from one area ultimately affects the sward. Pastures that have been seeded for ryegrass or white clover or both deteriorate, but with good treatment in the way of fertiliser and lime, combined with careful stock management, on the better types of soils areas can be harvested for white clover seed and still maintain a first-class pasture. On the lighter plains soils in both islands one or perhaps two crops in favourable seasons is as much as can be expected.

A factor which influences greatly the decision as to when to seed the area is the price; a yield of 30lb. of machine-dressed seed may pay with seed at 4s. a lb., but is scarcely worth the loss of grazing with seed at 2s. a lb.

Strains of White Clover

Investigations initiated by W. Davies and E. B. Levy disclosed that New Zealand, like other countries, had a wide range of white clover strains. The longest-lived and highest-producing strains were localised on the very fertile lands of Rangiora and Woodend in North Canterbury and of parts of the Heretaunga Plains in Hawke's Bay. Very little ploughing of these areas had been done, and under conditions of high soil fertility and permanent pasture management a superior strain of white clover was developed. At the other extreme an almost annual type of clover with low production was present on the light cropping lands of Canterbury. In other districts intermediate types and mixtures of types were present.

The export trade in white clover seed of 20 to 30 years ago recognised two main types, "wild" white and "stubble" white. The "wild" type in general was that from permanent grassland areas; the "stubble" type was largely the product of frequently-cultivated areas, as often as not the produce of volunteer growth following the harvest of a cereal. It was not surprising that such clover was of inferior strain or that confusion existed about the quality of New Zealand white clover and individual lines frequently were described wrongly.

The stacking of white clover crops, though it resulted in good seed, caused some loss through handling and is now not as common as it was before the advent of the header harvester. Stacking allows the seed to ripen thoroughly and the crop to become thoroughly dry and fit for threshing.

In recent years the header harvester has contributed greatly toward increasing the amount of white clover saved for seed.

Whether the presence of inferior strains was primarily the result of local conditions or of the importation of white clover seed which was an important feature of the seed trade in earlier years, and even when export was also being undertaken, it is impossible to say. Probably both factors had some influence in their development.

Seed Certification

The presence of these divergent strains provided a good field for the introduction of a scheme of seed certification for white clover, which was initiated in 1930. Chiefly because of the volunteer nature of white clover in many districts and the difficulty of obtaining any great degree of strain purity in naturally-occurring lines, progress under seed certification, on the surface at least, has been slow. Many modifications of the scheme have been necessary to meet changing conditions, and only now is real progress in the development of a superior strain under certification becoming apparent.

Certification was applied first to seed from old pastures and then to natural strains of superior merit, but as a pedigree strain was selected from the best natural strains and seed supplies became available this formed the key material for the certification scheme. The scheme has made possible a much wider distribution of seed of better strain quality and, with direct benefit to production, has extended the sowing of white clover seed into areas where inferior volunteer strains grew previously and white clover seed was not sown because it "came naturally."

Seed is now certified in one of the following classes:—

Certified Government Stock seed, produced under contract by the Department of Agriculture from nucleus stocks supplied by the Grasslands Division of the Department of Scientific and Industrial Research. It is distributed for further multiplication under the most suitable conditions.

Certified Pedigree seed, from the second or subsequent harvest from an area sown with Certified Government Stock seed, a plot test of the first harvest having revealed no contamination in the type of seed sown on the area.

Certified Mother seed, which may be taken in the first harvest from an area sown with Certified Government Stock seed or in the second or subsequent harvest from an area sown with Certified Pedigree seed, the first harvest of which has shown no undue contamination in the type of seed sown.

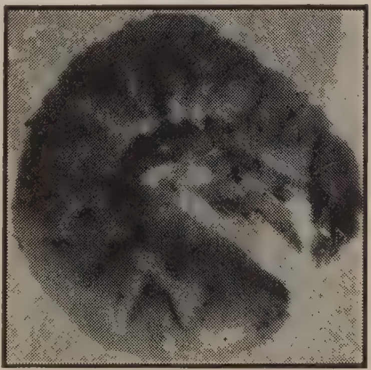
Certified Permanent Pasture (Pedigree Strain) seed, which is obtained in the first harvest season from areas sown with Certified Pedigree seed.

Certified Permanent Pasture seed: Certification in this class is based on the fact that superior strains of white clover produce higher amounts of a cyanogenetic glucoside than do inferior strains. Samples of seed are submitted to a laboratory test (called the picric acid test) and lines showing a satisfactory standard are accepted for certification.

Seed certified in all but the last class is entirely of pedigree strain; Certified Permanent Pasture seed may represent seed either of pedigree origin or of superior strains of natural origin.

Fungus and Insect Pests

White clover, like other pasture plants, has its insect pests. The porina grub (*Oxycanus* sp.) and the grass-grub (*Odontria zealandica*) are responsible for a very heavy death rate of plants, especially if the area has been seeded—in fact, the closing of an area for seed often sounds the death knell of that pasture. In certain seasons, however, an application of lime and superphosphate and good autumn rains have resulted in remarkable recovery on an area badly eaten out by grass-grub. The seed shed at harvesting, the natural trailing habit of the plant, and its ability to root at the nodes help to bring about this recovery.



[*Department of Scientific and Industrial Research photo.*

The grass-grub.

The brown beetle, adult form of the grass-grub, is on the wing from November onward, depending on the locality, and finds the condition of the pasture just before harvesting ideal for laying its eggs, which hatch out at a time when the plant has already had a setback from harvesting. The grubs attack the roots of the plants about 2in. below the ground, and unless good rains fall, the death-rate in plants may be very high. Work on the control of the grub has been carried on for some years, but as yet no satisfactory control measures have been devised.

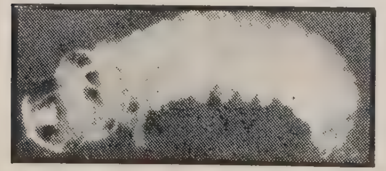
The porina caterpillar.

The porina moth is on the wing between November and January. It also lays its eggs in pastures and thrives where growth has been allowed to get away. The juvenile form, or subterranean caterpillar, works at night, feeding on the leaves of the plant. If in sufficient numbers, eventually it cuts the growth to ground level and the plant dies from lack of air and food. The caterpillar feeds well into the winter at a time when growth is at its lowest ebb, so that the plant has no chance of survival. During the day the caterpillar buries itself 4 to 6in. below ground and only excessive moisture will bring it to the surface. The caterpillar can be controlled by the use of bran, molasses, and paris green or arsenate of lead made into a mash and topdressed on to the pasture. If put on soon enough, this mash

PRODUCTION OF WHITE CLOVER SEED

White clover is an important constituent of pastures throughout New Zealand. In suitable districts, such as Canterbury, it is used for both seed production and grazing.

gives good control. It should be broadcast at the rate of 60lb. per acre. Sufficient to treat an acre is made up by mixing thoroughly while dry 1lb. of paris green with 25lb. of bran; 8lb. of molasses is then dissolved in 3 gallons of hot water and added to the mixture. The whole is mixed thoroughly until the bait is moist but not sloppy. In this condition it should crumble easily and not stick together in a mass.



Larva of the clover case-bearer.

The clover case-bearer (*Coleophora spissicornis*) is a moth which lays its eggs when the clover is in flower. These are hatched out when the seed begins to ripen, and the grubs feed on the immature seed. So far this insect has not caused serious losses, but in certain seasons it is responsible for some damage to seed. No method has yet been devised for its control.

Growth of Export Trade

New Zealand requires about 750 tons of white clover seed a year for her own requirements, so that despite the quantity exported each year New Zealand's best market is still her own.

As far as records show, it would seem that New Zealand first began to export seed in any quantity about 1918 to 1920, and between 1922 and 1924 prices for white clover seed rose to 2s. 6d. and 3s. a lb. This demand no doubt was brought about by the prospects of further exports, because by that time the considerable development of the bush country of the North Island had slackened off and there were surpluses of seed. The seed exported at that time was drawn mainly from the Kaiapoi, Woodend, and Rangiora districts, which subsequently were proven to have a superior type of white clover. This happy chance was responsible for giving New Zealand wild white clover a good reputation in the British market. The exports grew from a few tons in those years to about 1400 tons in 1945-46, of which 916 tons were certified.

EXPORTS OF WHITE CLOVER SEED (tons)

Destination	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947
Certified											
United Kingdom ..	39	40	33	168	246	278	165	614	499	660	468
Australia	26	41	28	15	27	10	30	24	48	36	63
U.S.A.	4	2	8	13	58	4	26	171	90	53	7
Canada	1	1		1			14	11		11	13
Other countries ..	1			1	1		5	18	47	156	186
Totals	71	84	69	198	332	292	240	838	684	916	737
Uncertified											
United Kindom ..	37	52	70	110	245	200	15	50	41	250	115
Australia	16	28	16	14	16		30	20	21	29	8
U.S.A.			8	1	69	25	76	405	139	167	6
Canada				2	20		13	24	6	3	10
Other countries ..	1	8	3	3	2		6	27	13	79	362
Totals	54	88	97	130	352	225	140	526	220	528	501
Total exports ..	125	172	166	328	684	517	380	1,364	904	1,444	1,238

Price Fluctuations

The price of white clover seed has fluctuated considerably over the years. First the price of imported seed and later the price which could be obtained on the overseas market set the local market prices. In the 1920's the price rose and fell between 9d. and 3s., and in 1929-30, just before certification was introduced, it was 1s. a lb. As more certified seed became available and the demand grew, the price crept up until it was as high as 7s. 6d. for Certified Pedigree white clover. These prices have since declined and now range between 3s. 6d. and 4s. for Certified Mother Seed and about 1s. less for uncertified seed.

Benefits of Industry

Undoubtedly the greatest single contribution to improved methods of producing white clover seed has come from the use of the header harvester. Its introduction has lessened the work, reduced the risk, and has made possible the harvesting of areas which, under older conditions of harvesting, would have been unprofitable.

The identification of superior strains of white clover under certification, the development of a pedigree strain from the best natural types available, and the expanded use of white clover seed in pasture mixtures in New Zealand have been prominent features associated with the development of the industry. Coupled with these have been the recognition given overseas to the better strains of New Zealand white clover and the place which these have won, particularly in the United Kingdom, leading to the present overseas export market. All these have given somewhat of an air of romance to the white clover seed industry, in addition to the undoubted benefits which have befallen the farming community as a whole through its development.

◆

QUINCE CULTURE

By L. R. RENOUF, Orchard Instructor, Department of Agriculture, Alexandra.

THE quince, *Cydonia vulgaris,* a native of southern Europe and the more temperate parts of Asia, is recorded as having been cultivated by the ancient Greeks and the Romans and is said to have been introduced into England from Austria in 1575. Quinces have been grown in New Zealand for many years and some very old trees are still to be seen near homes on early-established farms. More recently quinces have been planted in commercial orchards throughout New Zealand and there is now a total of about 167 acres in quinces, of which 130 acres are in the Auckland, Hawke's Bay, and Nelson districts.

[*News-photo Service photo.*

Champion quince tree in full bearing.

THE quince, which is closely related to the apple and pear (*Pyrus genus*) was classified erroneously by botanists as *Pyrus vulgaris,* a genus to which japonica, a beautiful flowering shrub grown extensively in New Zealand, belongs. The fruit of the quince emits a powerful and rather peculiar perfume when ripe and has a very sharp and acid flavour. In a raw state the flesh is very hard, but when cooked it makes excellent preserves and jellies.

Soil and Situation

The quince can be cultivated successfully in most parts of New Zealand, but it does best in the warmer districts. Though it will adapt itself to various soils and situations, it prefers fairly-deep, rich soils in well-sheltered, sunny localities where there is a generous supply of moisture and the soil is free working.

Because the quince prefers more moisture than most other fruits, it grows well on the banks of creeks or water races, but provision should be made for drainage, as trees planted on low-lying areas on heavy soils will not thrive if the roots are in water for any length of time.

Quinces will not thrive in very dry soils and it is not uncommon for many fruits to fall during dry weather. This fall may be sufficient only to effect a thinning, but under very dry conditions the whole crop may be lost. Varieties show varying resistance to drought, those producing large-sized fruit suffering most.

It is important to shelter quince trees from strong winds, as, owing to their willowy nature of growth, considerable branch rub and other superficial injuries to the fruit result when trees are planted in exposed positions.

Propagation

Quinces are generally grown on their own rootstocks, being budded to the varieties required as soon as the stocks are large enough or sufficiently well rooted. The simplest and most economical method of raising stock is from cuttings taken from the current year's growth. Shoots of medium vigour, from about the thickness of a pencil to ½in., should be selected, the top 6in. of the unripened part of the shoots rejected, and the remainder cut into 8 to 10in. lengths. These should be planted 3 to 6ft. apart in rows, leaving about 3in. of each cutting above ground level.

In warm districts cuttings can be planted in late autumn and in colder districts in early spring. Cuttings taken during the winter for spring plantings should be bedded temporarily in sand. Callusing then occurs during the first 2 months and root formation begins in the spring, the time depending on local conditions. Rooted cuttings are ready for planting in nursery rows after making one year's growth and they may be budded during the following spring. Quince trees may also be propagated from stools, layers, or seed.

At one time nurserymen propagated the quince mainly for use as the principal rootstock for pears because pears budded on to quince stock are forced into bearing at an early age. However, trees are dwarfed and their life is shortened—effects produced by the root system of the quince, which is weaker than that of the pear. The quince makes more fibrous roots, but does not develop the large, strong roots characteristic of the pear.

Cultivation and Manuring

With quinces, cultivation, together with the maintenance of a proper supply of organic matter in the soil, is just as important to successful production as it is with other fruits, but because the quince is shallow rooting, deep cultivation within the rooting area must be avoided.

To maintain production and tree development annual applications of a mixed fertiliser (2 parts of superphosphate, 3 parts of blood and bone, and 1 part of potash, all by weight) should be applied at the rate of from 3 to 10lb. per tree, according to the richness of the soil and the productiveness of the tree.

Varieties

Compared with many other fruits the number of quince varieties is not numerous. Of those grown in New Zealand the following have proved successful for commercial production in one or more of the fruit-growing districts and a large proportion of the total area is planted with these varieties:—

Smyrna: The most popular variety grown in northern districts. Smyrna is one of the least susceptible to the fungus disease fabraea scald. It is an early and consistent bearer producing medium-size fruit of good quality and flavour.

Van Dieman: This variety produces regular crops of fruit of fine quality and texture, but because of its susceptibility to fabraea scald, should not be grown in districts where humid conditions are often experienced.

Pear Shaped: Produces good crops of medium to large fruit with a somewhat woolly, yellow skin. The flesh of the fruit is dry, but of fairly-good flavour. It is a hardy variety.

Champion: A fairly early maturing variety, but rather a shy bearer except in ideal conditions. It produces large, round, bright yellow fruit of good flavour.

Champion Improved: A consistent cropper which produces large, round fruit of good flavour.

Portugal: This variety develops into a large tree, but it is less hardy than most varieties and should be grown in warm districts only. The large golden-yellow fruit is pear shaped, though widest in the middle, and is covered with grey wool. The fruit is of good flavour and quality.

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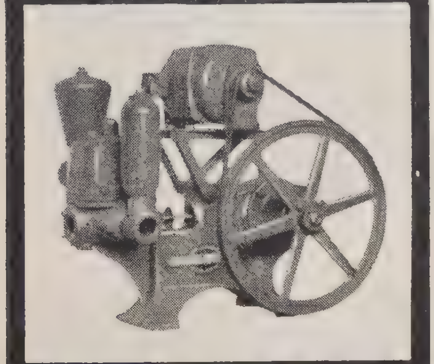

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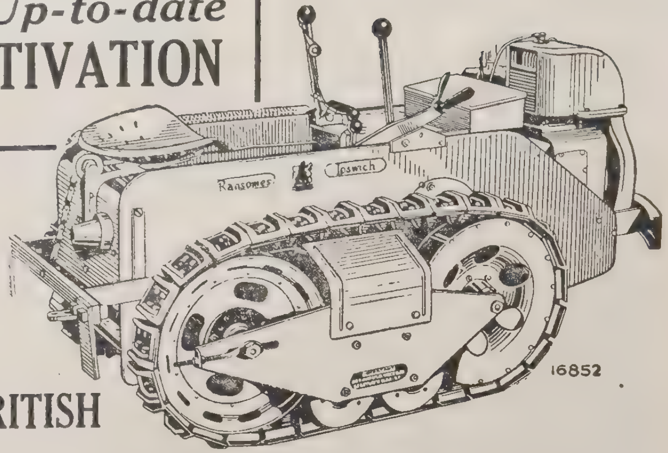

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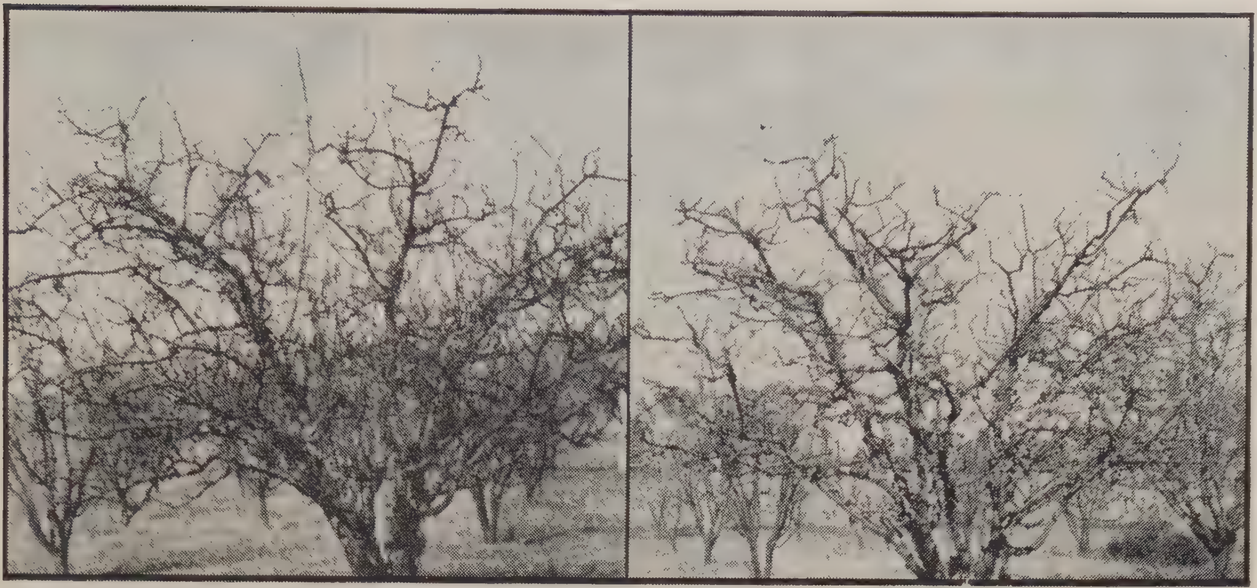


[*News-photo Service photos.*

Left—Pineapple quince tree before pruning. (The tree has been pruned from time of planting.) Right—The same tree after pruning.

Varieties grown to a less extent are: Apple Shaped, Burbanks Orange, Bourgeat, De Vranja, Giant of Gascony, Mannings Seedling, Meechs Prolific, Missouri Mammoth, Pineapple, Midlothian Giant, and Zucker.

The behaviour of some of the above varieties varies considerably under different climatic and soil conditions, and to secure a selection suitable for a particular district, growers should seek the advice of their local Orchard Instructor.

As almost all varieties of quinces are self-pollinated and self-fertile, they form fruit freely without the intervention of insects or foreign pollen.

Pruning

Under reasonably-favourable conditions the quince is a very strong grower for a few years after planting. Development continues until the tree attains normal stature and has come into bearing. The rapidly-grown branches are lithe and willowy and unless heavy pruning is done in the early stage of tree growth, a dense bushy tree will result.

The quince tree does not require special treatment during the first few years after planting, though hard pruning will ensure the development of a strong framework. The aim should be to develop eventually a tree having 6 or 7 well-spaced leaders—with fruiting arms developed from each leader—and well furnished with fruiting wood. After the first few years most of the lateral growths developing from leaders should be thinned out and those remaining developed for fruit production.

[*News-photo Service photo.*

A neglected quince tree; only the bottom growth has been pruned off.

The quince has a characteristic fruit-bearing habit. In spring buds on 1-year-old wood develop leafy shoots 3 to 4in. long which terminate in single flowers. Terminal buds on the 1-year-old-wood also form flowers.

When a framework has been developed the tree will persistently attempt again to assume its natural bushy habit. There will be profuse growth of water shoots from the main limbs and quite dense lateral growths will develop. At this stage pruning should consist of the removal of all water shoots, unless they are required to replace broken limbs, and the judicious thinning out of the laterals and the overcrowded yearling growths to ensure even distribution of fruiting wood, to allow free entry of light, and to provide for adequate spray penetration.

Yearling growths at the terminals of the leaders, fruiting arms, and the laterals should be shortened each year to maintain the balance between fruit and wood production.

Control of Pests and Diseases

Though the quince is not subject to attack from a large number of insect pests and diseases, there are a few which, if left uncurbed, will prove troublesome. The most destructive insect pests are the pear slug and the codling moth and the major diseases are frabaea scald and fireblight.

PESTS AND DISEASES AFFECTING QUINCES

[*News-photo Service photo.*

Above—Young quince tree unpruned. Below—The same tree pruned.

Pear Slug

The body of the pear slug is distended in front and tapers behind. In the early stages it is blackish, but later it changes to a brownish shade, when it is sticky and slimy. In the adult stage the insect, which is one of the "saw fly" species, deposits its eggs from the underside of the leaves through its ovipositor to the upper surface, the eggs being left in pockets just under the cuticle, where they appear as pale, whitish blisters about the size of a pin head. By feeding on the upper side of leaves and eating the epidermis pear slugs do considerable damage and cause leaves to wither and turn brown. Heavily-infested trees may be defoliated entirely by mid-summer, fruit becomes stunted and fails to mature, and the development of buds for the next season's crop is impaired. The slug can be controlled by spraying with a stomach poison such as arsenate of lead.

Codling Moth

Though a major pest of the apple and pear, codling moth is not so troublesome on quinces, and the recommended sprays will ensure control.

Fabraea Scald

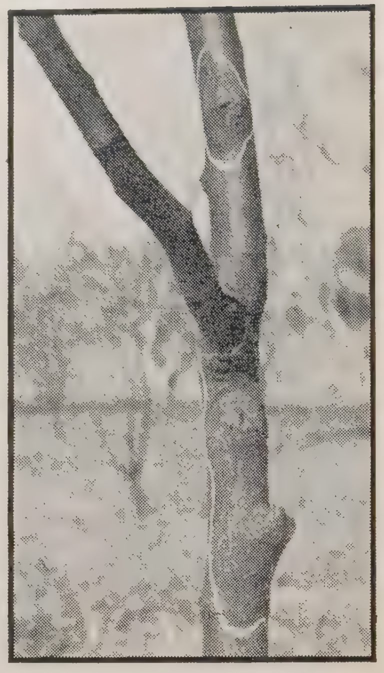
Fabraea scald is usually found wherever the quince is grown and is possibly the chief factor influencing successful production. It attacks the leaves, shoots, and fruit. On leaves it forms spots, which, if numerous, may cause so much damage that leaves fall prematurely. Its effects on shoots are generally slight, but if infection is severe, laterals may be killed. The fruit is more seriously affected. Large discoloured spots and frequently cracks are formed, which not only disfigure and distort the fruit, but permit the entry of other fungi, which cause rapid decay.

To control fabraea scald overcrowded shoots should be thinned out and the recommended sprays applied.

Fireblight

Fireblight is a most destructive bacterial disease which has caused considerable damage among pears and apples as well as to quince trees, particularly when regular inspections and control methods have been neglected. Several varieties of quinces, particularly Missouri Mammoth, are very subject to fireblight attack and once the organism reaches the large limbs, the disease will assume a very virulent form.

The first signs of fireblight infection occur at blossoming, when young infected fruits wilt and become discoloured (brown or black). This stage is usually followed by wilting of the leaves on the blossom spurs or laterals, because the disease passes through the blossom to the wood. When this occurs the leaves do not fall, but turn brown and droop.



[*News-photo Service photo.*

Fireblight cankers (margin of cankers outlined with chalk) and leader of young quince tree.

The disease passes downward and large branches may be infected. Finally, large cankers, which show as areas of bark darker coloured than normal, and which have a sunken appearance, form on the branches. Later, cankers become delineated from the healthy tissues by the appearance of a sharply-defined crevice, which outlines the cankered area. In the spring cankers may have a water-soaked appearance and frequently exude drops. It is this ooze which, when transported to other trees by insects, spreads the disease.

On fruits fireblight produces a soft rot and numerous globules of ooze, which are scattered over the skin.

Infection from the disease may result in loss of part or all of the crop through injury to the fruit or it may kill laterals and branches and sometimes the whole tree.

To control fireblight infected parts should be removed—cutting well below the visible infection—diseased branches burnt, and wounds sterilised by swabbing with a solution of 1 gramme of mercurichloride, 15 c.c. of hydrochloric acid, and 1000 c.c. of water.

In the event of an infestation of scale insects winter oil at a strength of 1 in 20 should be applied at the dormant stage.

References

"Fungus Diseases of Fruit-Trees," by G. H. Cunningham.

SPRAY SCHEDULE FOR QUINCES

Time to apply	Spray	Disease or pest
Bud movement	Bordeaux 5 : 4 : 50	Fabraea scald
Open cluster to pink	Bordeaux 3 : 4 : 50	Fabraea scald
Petal fall	Bordeaux 3 : 4 : 50	Fabraea scald
14 days later	Bordeaux 3 : 4 : 50	Fabraea scald
18- to 21-day intervals, up to early February	Bordeaux 3 : 4 : 50, plus arsenate of lead ¾lb. to 50 gallons	Fabraea scald, pear slug, codling moth

Improving Standard of Canterbury Pastures

THE development of Canterbury pastures and farming systems on different types of soil in the province were reviewed by C. C. Leitch, Assistant Fields Superintendent, Department of Agriculture, Christchurch, in the following paper which he delivered to the 1948 conference of the New Zealand Grassland Association.

On the heavier land of Canterbury, such as in the vicinity of Halswell, pastures are kept down for 10 years or longer. They are usually sown with a mixture of perennial ryegrass, white clover, red clover, and sometimes timothy and cocksfoot.

DURING the past 9 years the use that pastures can be in the farming rotation has been realised by the farmers of Canterbury, and they now have a much greater appreciation of the usefulness of pastures in the farming programme; further, they have consolidated their ideas on pastures and there is not that hesitancy today that was apparent earlier. Farmers have become pasture-conscious just as they have become lime conscious, and a greater proportion of them are demanding better seeds with the knowledge that without their use good permanent pastures are not possible.

Canterbury as a whole is essentially a province devoted to arable farming and as such would not be expected to contain really-permanent pastures of the age of some of the North Island pastures; they are the exception rather than the rule. The climate does not lend itself to really-permanent pastures, the rainfall being on the average from 23 to 30in. Further, if every farmer in Canterbury went in for permanent pastures and stock, the position with grain crops would be more desperate than it is at present.

The early pioneers exploited to the full Canterbury's eminently-suitable climate for arable farming and they had—a great number still have—the name of being very efficient at growing almost any type of crop suited to the climate. They were not so very interested in pastures because it was considered that they were only of secondary importance, and this was probably true while the virgin fertility of the soil was in plentiful supply, but a great number of Canterbury farmers would be very thankful to have some of that virgin fertility today. The depletion of the soil was very gradual and it has been during the past 15 to 20 years that this depletion has been felt. It is not possible today to grow two or three white crops in succession and get payable yields. It is to pastures and stock that the Canterbury farmer has had to turn in an endeavour to restore some of that lost fertility, and in a great number of cases the process of building up fertility, while slow, is taking place.

Changes in Seed Mixtures

As a result of the progress made in improving pasture species, farmers now have at their command high-producing strains of perennial, Italian, and short-rotation ryegrasses, cocksfoot, white clover, cowgrass, and Montgomery red clover, and the great majority of them are putting them to good use. With the introduction of seed certification and the good prices being obtained for these seeds, there has been a gradual change in pasture mixture, farmers on suitable soils exploiting this market to the full. This of necessity meant that where in the past a mixture of ryegrass, white clover, and red clover was sown, this was changed to ryegrass and white clover or to a temporary grass such as Italian ryegrass and red clover, so that one grass or clover could be harvested without the other species hampering the ripening and harvesting of seed.

In certain areas the saving of seed is not possible because of the soil and topography, so that there have gradually been evolved three classes of pastures—pastures for grazing purposes only, pastures for seed production, and special-purpose pastures.

Pastures for grazing only are to be found in areas where the country is too steep for successful harvesting, where much cropping is being done which does not allow for both extensive cropping and the shutting up of pastures for seed to be carried out, or where some special type of farming is practised such as town-milk supply, dairying, or stud breeding. In this case the pasture mixture consists of species that will give the maximum grazing through the season and it is made up of perennial ryegrass, white clover, and red clover. On the heavier soil type some timothy is included and on the lighter soils cocksfoot and subterranean clover.

Pastures for seed production exist on a great majority of farms throughout Canterbury. A climate that is suited to crop production is also suited to pasture-seed production, and therefore there has been a change in the mixture so that the farmer can change to seed production if so desired. In Canterbury in most seasons it is difficult to control the feed, and in these cases this surplus feed has been turned to profitable advantage by allowing the pasture to run to seed. The mixture in this case is perennial ryegrass and white clover with sometimes crested dogstail included, as dogstail does not interfere in any way with the harvesting of seed. The general procedure is to autumn sow the pasture, utilise it in early winter and early spring for grazing, and then close the area for seed about mid-October. In the case of white clover the area is closed for seed between about the end of October and mid-November. After being harvested the area is again used for grazing.

Special-purpose pastures: There are areas sown for a particular purpose, such as Italian ryegrass for greenfeed and then a seed crop, or on heavy soil types timothy for summer grazing. On the lighter soils lucerne and cocksfoot are sown for grazing in spring, hay in mid-summer if the season is suitable, and autumn feed for lamb fattening. This type of special-purpose pasture can be very useful on some of the lighter soil types in Canterbury. In other cases Montgomery red clover and cocksfoot are sown for hay and seed and ultimately the area becomes a pure cocksfoot pasture and can be utilised for either seed production or grazing.

Which of the three classes of pasture is used is largely governed by the size

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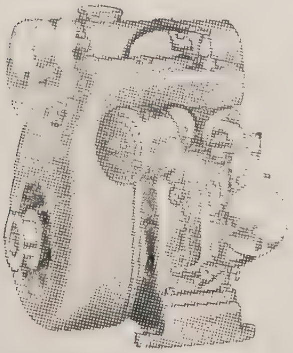

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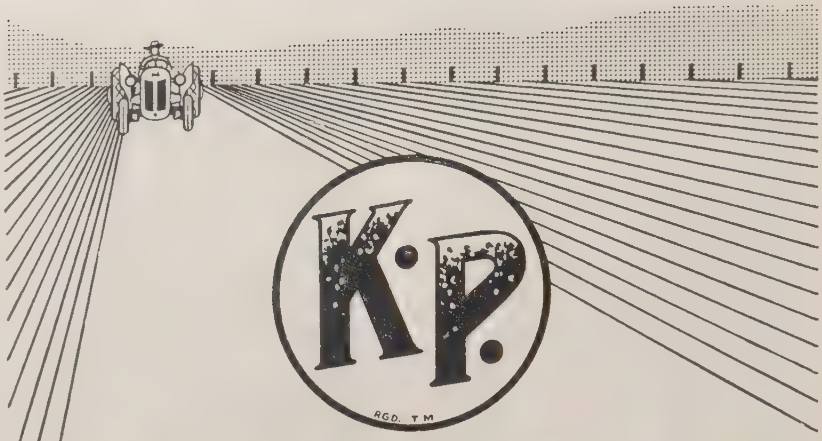

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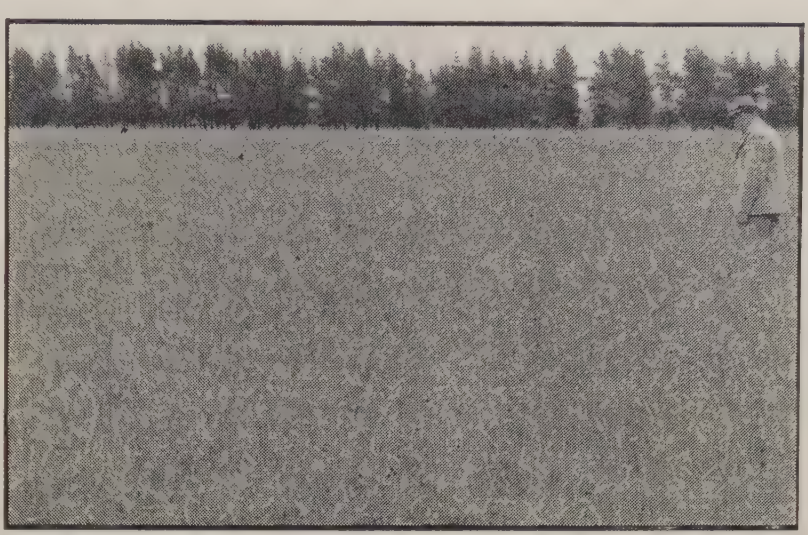
of the farm, soil type, and rainfall. A survey of the soil types shows how they vary within very short distances, and with this variation the size of the holding varies also, as does the type of farming. As an instance, on the main south road from Dunsandel to Bankside there is a good depth of soil at Dunsandel, which gradually peters out about 5 miles from Dunsandel, changing from good cropping and pasture land to light shingly country which grows mainly browntop, sweet vernal, and hairgrass. There are many examples of this variation over a good portion of the Canterbury Plains.



In some districts of Canterbury cocksfoot becomes dominant in pastures and is utilised for either seed production or grazing.

Three Main Soil Types

Broadly, Canterbury has three main types of soil:—

The heavy soils of Waikari, Waikuku, Woodend, Kaiapoi, Tai Tapu, Leeston, Southbridge, Wakanui, Eiffleton, Clandeboye, Temuka, and Willowbridge.

The medium soils of Lincoln-Leeston, Darfield, Dunsandel, Barrhill, Methven, Orari, the downlands of Timaru, and the downs of North Canterbury.

The light soils at Glasnevin, Burnham, Winchmore, Ealing, Rangitata, and Glenavy.

Heavy Soils

The principal crops on the heavy soils are wheat, barley, peas, potatoes, and pastures. Here the establishment of pastures is in general by sowing down with the crop, usually an autumn-sown wheat crop or spring-sown barley. One of the reasons put forward for this method of sowing is that because of wheat growth it is sometimes difficult to establish good pastures on a fallow. The mixtures used include perennial ryegrass, white clover, red clover, and sometimes timothy and cocksfoot.

On some of this country that is well drained an occasional crop of red clover or white clover is taken, but in the main it is used principally for cropping and grazing, the life of some of the pastures on these soils being more than 10 years.

Medium Soils

The principal crops on the medium soils are wheat, oats, barley in certain districts, peas, potatoes, linseed, and in South Canterbury linen flax. Rape and turnips are grown for lamb fattening and chou moellier and swedes (in certain districts) for winter maintenance. It is on these soils that real mixed farming is practised—some crops, small seeds, fat lambs, and lucerne for hay.

Pastures constitute a good proportion of the farms and their life is from 4 to 6 years. The mixtures sown are of the simple type, being mainly perennial ryegrass and white clover, and are sown with a crop, with rape and turnips, and on a summer fallow. Some farmers are practising all-grass farming, growing only those crops necessary for the maintenance and fattening of stock. The general mixture is made up of from 1 to 1½ bushels of perennial ryegrass, 3 to 4lb. of white clover, and sometimes crested dogstail in certain areas. On some of the larger holdings a mixture of Italian or short-rotation ryegrass and either red clover or white clover is also sown. It is usually drilled on a summer fallow, using 1 to 1½ bushels of Italian or short-rotation ryegrass and 3 to 4lb. of red or white clover. By the use of this mixture it is possible to save perennial ryegrass or white clover as well as broad red or Montgomery red clover. The red clover areas can be grazed when the perennial ryegrass or white clover is closed for seed, usually about the beginning of December, by which time it is very often possible to take a draft of lambs and in this way to relieve the feed position.

On suitable country short-rotation ryegrass is proving valuable for the production of out-of-season winter feed. In recent years it has been profitably used for seed production.

The Italian ryegrass-red clover pasture is very often used if a paddock is bad with twitch. A certain amount of summer fallow then the sowing of a quickly-growing temporary pasture enable a good return to be obtained without allowing the twitch to gain in strength before the land is put under a summer fallow again to clean up the remaining twitch.

The general practice is to take a crop of perennial ryegrass for seed the first season, white clover the second season, and graze for the remainder of the life of the pasture.

It has been found also that on this type of land liming is almost essential if any white clover crops are to be harvested. This has been illustrated in South Canterbury, where as the result of liming and the sowing of good seeds white

CANTERBURY PASTURES

Lucerne has been regarded for many years as a valuable hay-producing crop in Canterbury. In recent years some success has been achieved in the growing of a lucerne-cocksfoot mixture for grazing purposes.

clover has been harvested on farms that have never previously grown white clover for a seed crop.

In Ashburton and part of North Canterbury the lupin crop is exploited to the full and has been responsible for a great improvement in the soil fertility, enabling easier establishment of pastures.

Light Land

The light land is essentially grazing country and though some crops are grown on the best of it, in the main the crops are fodder crops for stock. Rape, turnips, lupins, and greenfeed oats are the main crops and the sowing down of pasture is done with one of these crops or on a summer fallow. The most important constituent is subterranean clover, which is sown at from 2 to 4 and sometimes 6lb. per acre with perennial ryegrass, cocksfoot, and some white clover. There is no doubt that during the past 10 years subterranean clover has proved its usefulness on this type of country, and in some areas has improved the fertility considerably. Here also liming and phosphate are necessary for successful establishment. On most of this country the pasture is drilled to ensure a good strike and also for the placement of fertiliser.

More recently successful attempts have been made to establish cocksfoot and lucerne to bridge the gap when the subterranean clover goes off. The practice is to sow 15lb. of lucerne and 8 to 10lb. of cocksfoot drilled, either in 7in. drills or cross-drilled in late summer or early autumn—December to end of January. The sowing is allowed to establish and in spring is grazed by stock until October or later; if necessary, a hay crop is taken and the area again used for weaning or fattening lambs in autumn. The main consideration is the management, care being taken not to graze the lucerne too close; eventually the cocksfoot gets the better of the lucerne, but in the meantime some very valuable feed has been produced as well as a build-up in the soil fertility.

It is felt that this mixture could be used more widely on some of the light plains country with definite advantage. During the recent pasture competition it was gratifying to find some very good pastures on this type of country—better pastures for density and mixture than on land twice its value—and it is on these areas that the greatest improvement is expected during the next decade. Admittedly the last two seasons have been good, but they will be good again and it would be a retrograde step not to attempt this improvement just because of the dangers of dry seasons.

Greater Improvements Expected

Farmers generally are now conscious of the reliability of the better pasture species. The uncertainty of how long the pasture would last has been removed, and with adequate liming and fertiliser farmers can look forward to still better pastures. Stock numbers are increasing and it is felt that this increase will continue as the knowledge of management increases, so that the future for Canterbury pastures is bright, and greater improvements can be expected during the next 10 to 15 years.

RADIO BROADCASTS

RADIO talks to farmers will be given from Station 1YA Auckland at 7.15 p.m. on the following dates:—

August 3—"Current Farming Problems for the Month," by J. E. Bell, Fields Superintendent, Department of Agriculture, Auckland, A. J. Kerse, Fields Instructor, Department of Agriculture, Auckland, and H. Woodyear-Smith.

August 10—"Disease Control in Home Orchards," by I. L. Nottage, Orchard Instructor, Department of Agriculture, Auckland, and W. S. Kemp, Orchard Instructor, Department of Agriculture, Auckland.

August 17—"Potato Growing," by E. B. Glanville, Assistant Fields Superintendent, Department of Agriculture, Auckland.

August 24—Young Farmers' Clubs' session, by Matamata District Committee.

August 31—"Faults in Wool," by D. G. Austin, Sheep and Wool Instructor, Department of Agriculture, Auckland.

The following broadcasts will be made from 4YA Dunedin, after the stock session at 7 p.m. on the dates shown:—

August 10—"Farm Tractors," by J. N. McF. Whyte, Farm Machinery Instructor, Department of Agriculture, Dunedin.

August 24—"Sideline and Household Poultry," by W. L. McIver, Poultry Instructor, Department of Agriculture, Dunedin.

Other talks are given from 1YA Auckland on Tuesdays at 12.35 p.m., 2YA Wellington on Thursdays at 12.35 p.m., and 3YA Christchurch on Mondays at 12.20 p.m.

Record-breaking Ewe

THIS photograph shows "Grannie," a 16-year-old ewe on the property of Mr. N. W. Retter, of Ohaupo, in the Waikato, with her last family of twins. Born in 1933 as one of twins, the ewe produced twins the following year as a hogget, and clipped 16lb. of wool as a 4-tooth. To date she has produced 28 lambs and her last twins weighed 12lb. and 12½lb. respectively at birth.

On only two occasions has this ewe failed to give birth to twins—1943, when she had triplets, and in 1947, when she gave birth to a single lamb weighing 15lb. In spite of her outstanding production record, "Grannie" is still vigorous and in good health.

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BUTTER

Farm Dairy Instruction : Its Relationship to Milk and Cream Grading

By W. G. BATT, Supervisor of Farm Dairy Instruction, Department of Agriculture, Hamilton.

IN considering the relationship between farm dairy instruction and unsatisfactory flavours in milk and cream and their causes and remedies, some reference should be made to the milk and cream grading systems and their application. A better understanding of grading systems, a better knowledge of why produce is graded down, together with an explanation for the apparent inconsistencies of milk and cream grading results as judged by the condition of dairy premises and equipment, will assist in improving quality and remove some of the criticism which is sometimes levelled at grading systems through misunderstanding.

MILK for cheesemaking is graded by the curd test supported by the methylene blue test; milk for powder-making is graded by the senses supported by the methylene blue test, and cream for buttermaking is graded by the senses of sight, taste, and smell. Checking tests may be applied to milk by the Resazurin test and by microscopic count, and to cream by methylene blue, by Resazurin, and by the microscope. These are not officially recognised, but are sometimes useful if used to support the recognised methods.

All quality tests of a mechanical nature which are applied depend for their reaction on the development and multiplication of bacteria, and it is this fact which provides the reason for the many apparent and sometimes extreme inconsistencies between the grading results and the shed conditions, inconsistencies which sometimes cause the farmer to express dissatisfaction with the grading system and contempt for its results and sometimes to regard the grading systems as haphazard, unsatisfactory, and of no assistance.

A farmer who is above the average in cleanliness frequently finds that his produce is graded down severely, while a neighbour with much worse and perhaps very bad conditions gets much better results. The work of the Farm Dairy Instructor in the field reveals frequently and repeatedly that some suppliers with reasonably-clean equipment have considerable grading trouble, while others with very dirty equipment are not affected. They are frequently asked to trace the reason for a grade fault in cases where the equipment is visibly clean and find that other farmers grade well with machines and equipment in much worse condition.

These apparent inconsistencies give rise to much criticism, and discussion of some of the reasons causing such a position may assist to remove some of the misunderstanding which exists.

Quality, Not Grading, Inconsistent

The conviction from long experience in tracing the cause of flavours as between farm and factory and from experience gained in grading milk and cream down for various

Photograph in heading by National Publicity Studios.

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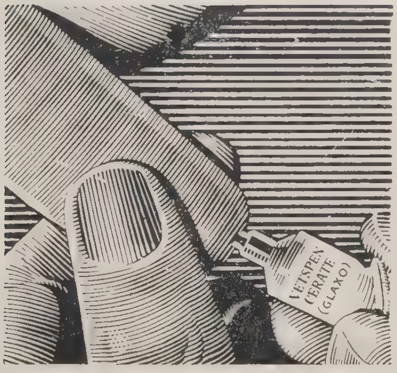

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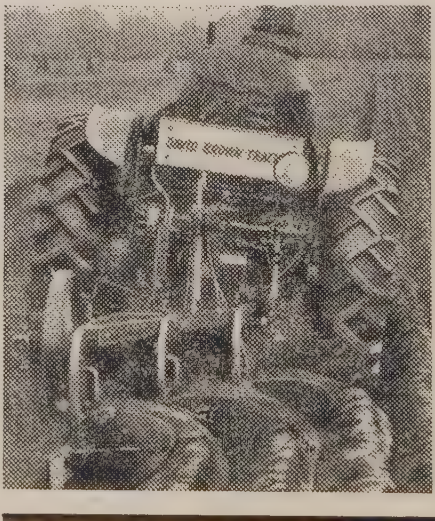

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reasons and then locating the cause at the farm is that it is the quality of milk and cream which is inconsistent and varies from day to day or week to week, rather than that the work of the grader is inconsistent.

Such experience will provide no criticism of the work of the senses grader, with the exception that generally he errs to leniency on the side of the farmer, which is contrary to what the farmer supposes.

Inconsistency of milk and cream quality is more pronounced in the Auckland Province than elsewhere, because of the more extreme variations in atmospheric temperatures, and cream which may be passed as finest after the influence of a cool night may be graded three points lower, or almost second grade, the next day by reason of a hot, humid night.

These inconsistencies are not the fault of the system of grading nor of the work of the senses grader, but are due to variations in the development of bacteria. As these tests in such cases depend for the reaction on the extent of bacteria present, obviously the produce is not graded down if there has been no development. The grading down of milk and cream is likely to be dependent not so much on whether milking machine equipment is unclean as on whether the bacteria from the dirty equipment multiply and develop. Under favourable conditions they will develop very rapidly; in other cases they may develop very little, despite the fact that the degree of uncleanliness is the same. The apparent inconsistencies which so often occur are therefore not so much due to faulty grading as to an irregular development of bacteria.

Unclean Flavours

Generally, a discussion such as this must refer mostly to unclean flavours, because these are prominent for most of the dairying season and are those on which there is most criticism in grading. In the early spring the receiving factory, the producer, and the Dairy Instruction staff are more concerned with feed flavours, with milk from newly-calved cows and cows in poor condition, and with a general and characteristic weakness in both body and flavour due almost exclusively to seasonal conditions, but through the main dairying season from October to April these flavours largely disappear and the unclean flavours become prominent by reason of the higher atmospheric temperatures bringing about a more rapid development and multiplication of bacteria from even small points of contamination.

Feed flavours and lack of flavour and poor body in cream during the spring can be controlled to some extent by care and better methods of handling on the farm. The farmer requires a knowledge of these methods and also some knowledge of the reasons why the bacteria giving rise to unclean flavours develop extensively and rapidly in some cases and very little in others.

As the greatest production is during spring and summer, the quality of most milk and cream depends on the control of bacteria, and the salient points to consider are:—

1. Unclean flavours are the chief concern and they are caused by the development of bacteria or by absorption.
2. Bacteria, particularly acid-forming, depend on moisture and warmth for their development.
3. The development of these bacteria can be retarded by cold; that is, by mechanical cooling processes or by the influence of cold weather.
4. The development of bacteria can be accelerated by conditions favourable to their growth, particularly warmth and moisture, and these are provided by humid weather, failure to cool milk and cream, mixing warm and cold cream, skimming cream too thin, etc.
5. Some classes of contamination, such as too close proximity of fermented skimmed milk, sour releaser rooms, sour rubbers, etc., will cause a much more rapid development of bacteria under favourable conditions than will some other classes of contamination, such as yellow slime, etc.
6. The presence of only one class of contamination, such as fermentation, will cause a more rapid development of bacteria than if two classes are present. A combination, for instance, of fermentation and yellow slime seems to retard the growth of bacteria.

The Effect of Temperatures

If these points are borne in mind, it is quickly apparent that milk and cream quality must vary considerably, particularly in districts where atmos-

[*National Publicity Studios photo.*

Weighing and tipping cream into the receiving vats at a dairy factory.

pheric temperatures have a wide range. The variations in grading results sometimes criticised by the farmer are caused largely by variations in weather conditions. Further, the farmer who uses a good cooling system will so retard the development of bacteria that he will produce milk and cream of better quality than that of his neighbour who has probably the same shed conditions and no cooling system. The former is merely applying in a small degree the principles of refrigeration, which mean that if perishable products are kept sufficiently cold they will keep indefinitely. An efficient cooler will overcome in part the influence of a hot night and it will prevent the grader from detecting a good deal of contamination, merely because the bacteria have not developed. The farmer who mixes warm cream with cold cream will speed up the development of bacteria by the application of warmth.

These are the reasons for many apparent inconsistencies and assuming that two sheds have equipment with the same type and degree of uncleanliness they may produce different qualities and different grading results by reason of:—

(a) one using an efficient cooler;

(b) one mixing warm and cold cream;

(c) one skimming much thinner than the other;

(d) if (c) applies, by one having a filled cream can, thus retarding agitation, and the other having a can half filled, thus assisting agitation.

(e) one having a better circulation of air around the dairy premises. (The absorption of unclean odours by milk and cream is greater in humid atmospheres than where a better circulation of air prevails.)

Most variations of quality occur, however, only in the presence of contamination. The supplier with equipment efficiently cleaned and cream properly cared for will not have his produce affected by hot and humid nights or other causes of variations, but will forward consistently-good quality throughout the season.

There is one other apparent inconsistency which causes much concern to many and also considerable criticism, and this occurs in those cases of extreme uncleanliness which are not detected by any method of grading. Here again the fault is not with the grading systems. Thorough checking of the results of milk and cream grading compared with actual conditions of dairy premises and equipment has shown that any test which may be employed will detect the majority of cases of uncleanliness, but there have been cases of extreme uncleanliness in which all tests have been applied to milk or cream, even to the microscopic count, only to find no reaction from either. In other remote cases it has not been possible to degrade cream severely after inspections which revealed producing conditions suggesting the lowest possible quality.

There is insufficient knowledge available to give a dogmatic reason for this position, but it appears that when there are a large number of different types of bacteria present they have a countering influence on each other and so retard development and provide neutrality. It is known that while there are many types of bacteria in produce from such cases, they can be placed in two distinct classes, the acid-forming and the non-acid-forming. These two classes normally fight for existence in the medium of dairy produce, and whichever becomes dominant will decide the particular flavour. Until one does become dominant the produce is more or less neutral in character and flavour.

Acid-forming Bacteria

Many of the acid-forming types are necessary and natural in milk and cream and the fine flavour of dairy produce depends on the development of clean acidity. It is when the acidity is uncontrolled or is produced by unsatisfactory types from unclean sources that the milk or cream is classed as unsatisfactory. Acid-forming types, therefore, are useful agents and they assist materially in overcoming or retarding many of the putrefactive types. They are produced from normal shed conditions and are easily controlled and killed by heat.

This explains why a large number of suppliers conditions on whose farms are above the average in cleanliness and whose produce grades well throughout the season frequently have considerable quality trouble in the late autumn, as soon as colder nights prevail. There is a small accumulation of bacteria, generally non-acid-forming, in scattered pockets of contamination throughout the equipment. It does not develop during the summer, because the warmth of the season promotes acidity, which retards its development, but it does develop as soon as colder weather prevails, because acidity is retarded. In these cases the cleaning operation must be more thorough and the sterilisation complete to remove the grade fault.

Sterilisation

In dealing with all grade faults the milking machine and all equipment which comes in contact with milk or cream should first be sterilised. The majority of faults in quality, particularly during summer, will be removed by this means, but it is wrong to assume that because equipment appears clean the cause of a grade fault should be sought elsewhere.

The first essential is to ensure that the equipment used in handling produce is free from undesirable bacteria and the only way this can be assured is to sterilise effectively with boiling water or a chemical steriliser in special cases. If this does not bring the desired improvement in quality, other probable causes can be checked and eliminated in turn.

In making improvements in the care and handling of milk and cream the following are the fundamental points for general practice:—

1. Use actually boiling water to sterilise the milking machine and equipment. Reduce the quantity, if necessary, as a smaller quantity of boiling water is more valuable than a larger quantity of hot water.

2. Make provision for a pure and clean air supply to the milking machine milk cooler, or cream separator. An air supply contaminated by the smell of cowyards or sour concrete or impregnated with dust seriously affects quality.

3. Make sure the milk or cream is held in a pure, clean atmosphere while awaiting delivery to the factory.

4. Have milkstone removed from the milking machine and equipment and proper brushware provided and used. Milkstone harbours bacteria.

5. Use an efficient milk or cream cooler. It assists in removing feed flavours and animal taints. Cream is contracted and its bulk reduced by efficient cooling, enabling it to be transported with less agitation. Cooling of milk and cream must be carried out in clean air; if it is done in a contaminated atmosphere, quality may be adversely affected by greater exposure.

6. Use caustic soda regularly as a cleaning agent. It is a germicide and has the power to pick up fat, the greatest enemy in cleaning equipment.

7. Produce a cream of good consistency. In very hot weather cream of 41 to 45 per cent. fat carries better, retards churning, and reduces the incidence of metallic flavours. In cool weather cream should be 38 to 40 per cent. fat to promote a little acidity.

8. Give thorough attention to the cleaning of milk and cream cans. As transport causes the constant shaking of produce on metal, clean and well-tinned cans are most important.

9. Ensure that all metal used in the milking machine and equipment is properly coated with tin. Bare metal is porous, harbours bacteria, and imparts metallic flavours to produce.

10. In dealing with grade faults never assume from inspection that a milking machine or equipment is sufficiently clean. Invisible bacteria are being dealt with and all parts must be sterilised. Never assume that a certain degree of visible cleanliness will produce good quality and that the fault in quality must be due to other causes.

Pig Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in August as under:—

Auckland—1YA, on August 23, at 12.35 p.m., "Is Your Piggery Efficient?" by C. W. Wallace, Supervisor, Waikato District Pig Council.

Napier—2YZ, on August 12, at 7.15 p.m., "Avoiding Losses in Pig Keeping," by the Supervisor, Tairawhiti District Pig Council.

Christchurch—3YA, on August 25, at 7.15 p.m., "How Can We Improve Carcass Quality," by H. W. McIntosh, Supervisor, Canterbury District Pig Council.

Dunedin and Invercargill—4YA and 4YZ, on August 8, at 7.15 p.m., "Management is the Basis of Profits," by N. Macdonald, Supervisor, Otago and Southland District Pig Council.

Types of Rape

By J. H. CLARIDGE, Agronomist,
Department of Agriculture, Wellington.

WHEN imported rape seed provided the chief source of supplies for the growing of the rape crop in New Zealand there was no assurance to the buyer as to the strain of seed he was purchasing. Certainly distinctive names, such as Broad Leaf Essex, Giant, and Kangaroo, were used to describe the seed being sold and certain lines of seed which were imported to this country were distinct in type and consistent with the descriptive terms applied to them. In many cases, however, lines were of mixed types, while in some cases lines similar and uniform in type were marketed under different descriptions. About 1930 an investigation was begun by the Plant Research Station of the Department of Agriculture and resulted in the identification of three main types of rape being imported.

THE three types have been briefly described as follows:—

Giant: This is a tall-growing type producing a definite central woody stem when approaching maturity. Its initial yield is the highest of all types, but its recovery after grazing is poor. It is more succulent and palatable than other types and is later maturing. As a result, in some districts it will not ripen satisfactorily, which leads to difficulty in fattening lambs on it.

Broad Leaf Essex: This is a relatively-short-growing, dense type, characterised by the development of very little woody stalk. It is inferior to Giant in initial growth, but recovers well even after two or more grazings and can produce a valuable bite of greenfeed early in the following spring.

Swede-like: This is an early-maturing type with very low yield. It has not been multiplied beyond the trial stage.

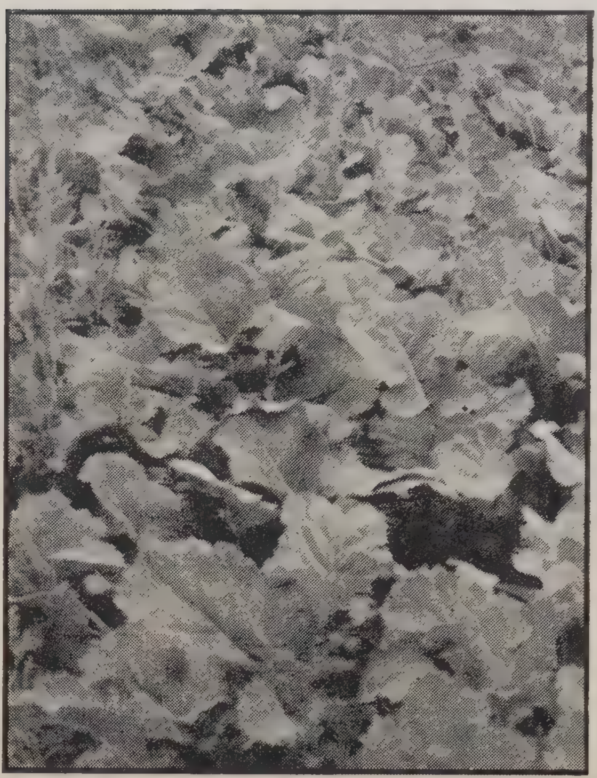
By 1935 quantities of pure seed of each of the types Giant and Broad Leaf Essex had been raised and were passed over to mercantile firms to multiply under the Department of Agriculture's certification scheme. The production of rape seed under certification extended to the stage where in 1940 the whole of the Dominion's requirements were being catered for, and since that time no rape seed has been imported. In fact, regular exports of seed are now being made to Australia and, occasionally, supplies have been shipped to the United Kingdom. The Agronomy Division of the Department of Scientific and Industrial Research, which took over some of the functions of the Plant Research Station of the Department of Agriculture, continued investigations into rape types and supplied each year nucleus lots of both commercial strains for further multiplication. Careful selection of the initial plants used in the raising of this seed tend to improve further the quality of the locally-grown Certified rape seed.

Improved Type Raised

Hybridisation of the three main types of rape was also undertaken, the most promising form developed being obtained from a cross between Giant and Broad Leaf Essex which had been back-crossed on to the Broad Leaf Essex parent. This produced a type similar in appearance to Broad Leaf Essex, but taller and more productive, though not quite as dense.

The new type of rape has been compared in critical trials with both Broad Leaf Essex and Giant at Lincoln and Palmerston North, while extensive field trials comparing it with Broad Leaf Essex have also been carried out. It matured slightly later than Broad Leaf Essex, but this was hardly noticeable under field conditions. It appeared to be rather more palatable than its dominant parent type, but possessed the same ability to recover after grazing and altogether appeared to be really an improved form of the original Broad Leaf Essex.

After the improved type had been tested thoroughly a start was made in 1945 to multiply seed stocks and in the following 2 years seed of this new type was distributed commercially under the identification B.L.E. II., the earlier type being identified as B.L.E. I. Subsequently quantities of B.L.E. II. seed were released to farmers, who found the new type quite acceptable as an alternative to the original type. For that reason, in 1948 the production under certification of seed of the original B.L.E. was discontinued. In future all certified B.L.E. rape seed will be of the improved type bred by the Agronomy Division.



The production of Certified Giant rape seed is being continued, but the relative inquiries for the two types indicate a decided preference for the Broad Leaf Essex type.

Resistance to Club-root

A further development in rape types, based on an approach from the angle of disease resistance, has also taken place. Work which was originated by the Plant Research Station of the Department of Agriculture and continued by the Agronomy Division and Plant Diseases Division of the Department of Scientific and Industrial Research has led to the isolation of a strain of rape possessing decided resistance to club-root disease. The type of plant represented by this strain resembles to some extent that of the Certified Giant type, but it is not so outstanding in its general characteristics. Its real claim to value is in its ability to survive on land heavily infested with club-root, where other types of rape fail completely.

Supplies of seed of this type of rape have also been multiplied under certification and limited stocks were first distributed for sowing in the 1948-49 season to districts most subject to club-root attack. Further limited stocks will be available for distribution during the 1949-50 season and thereafter it is hoped that supplies will be adequate to cope with the requirements of all farmers whose rape crops may be liable to severe damage by club-root disease.

There are therefore now available to the farmer three distinct strains of Certified rape seed:—

1. **Certified Giant**—A high-producing type showing very little recovery, which has been developed by plant selection.

2. **Certified Broad Leaf Essex**—A type developed by hybridisation, which gives a good initial yield and has the ability to recover after grazing.

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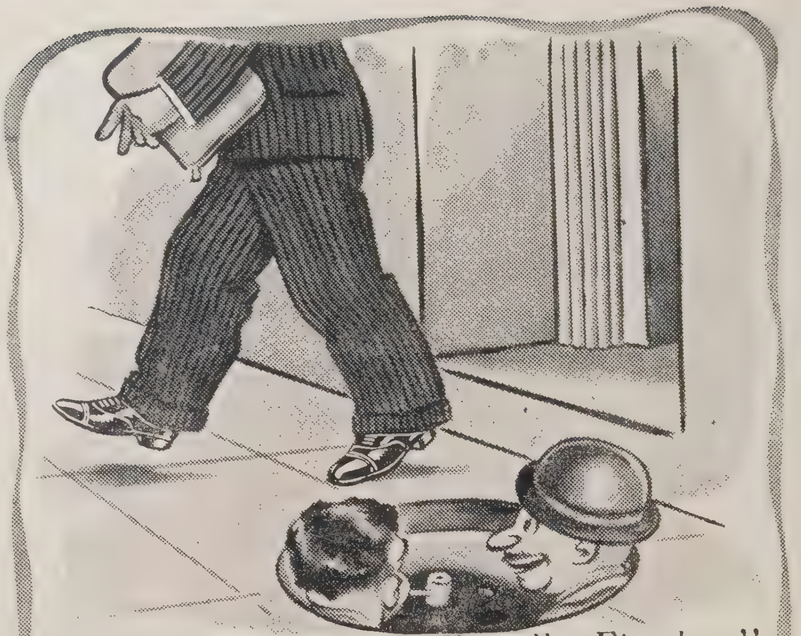

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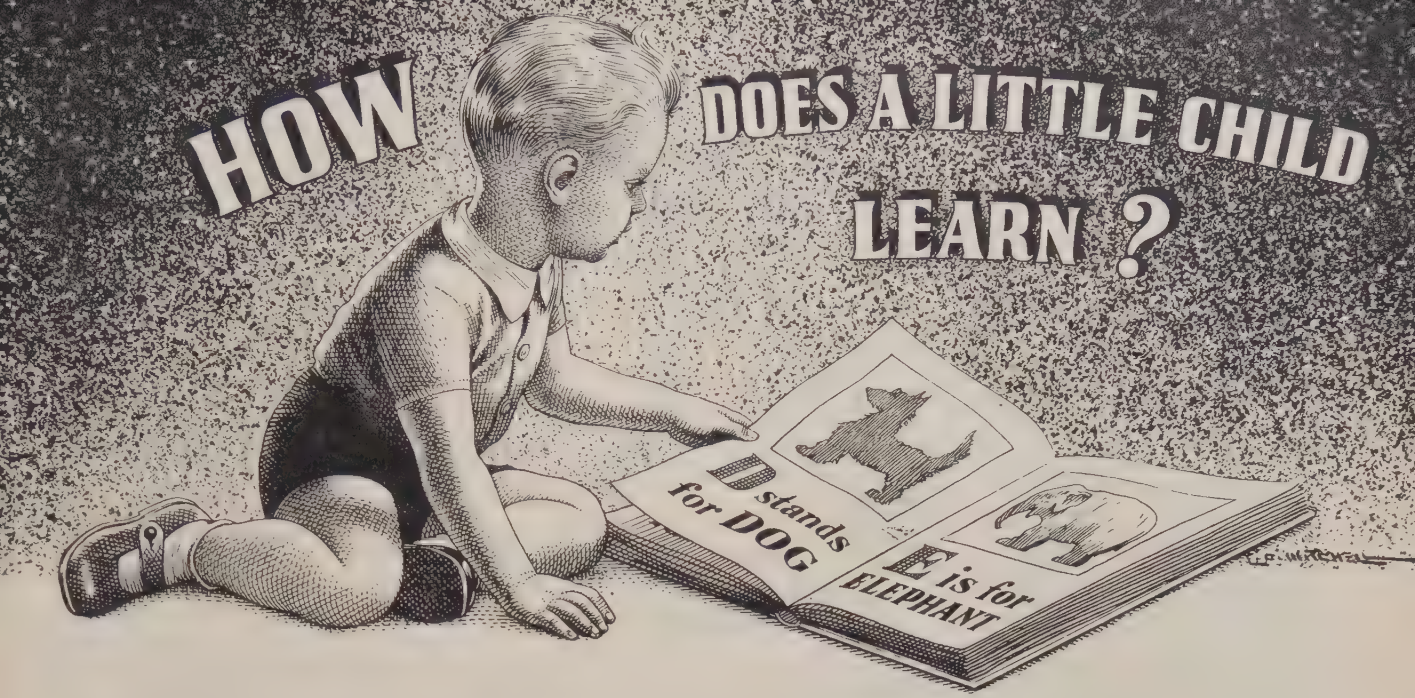
HOW DOES A LITTLE CHILD LEARN?



A CHILD may learn through satisfaction, through experiment, by asking, through imitation, and through suggestion. All of these ways help, provided the child is given time to learn, and they are discussed in this article, the third of a series by Dorothy Johnson, Rural Sociologist, Department of Agriculture, Christchurch, on child care and development.

A LITTLE child must learn to walk, to talk, and to begin to understand his world. He must learn to feed himself, dress himself, go to the toilet alone, wash himself, and put away his toys and even his clothes. Everything he touches, handles, and plays with increases his knowledge and his skill. All this occurs with the home as a background, and it is the older people who make the home. They choose its place, its furnishings, its books, newspapers, and music. With the daily behaviour and conversation of the adults, all these things make the atmosphere in which the child is developing.

Learning Through Satisfaction

How, then, does he learn these things? Undoubtedly the feeling of satisfaction is of the greatest importance in the process of learning. A child who gets this feeling out of anything will want to do it again. If what he wants is undesirable or not in his best interests, the parents must see that he does not get the satisfaction. The child who is allowed to get up again if he cries when he is put to bed will almost surely cry the next night, but if no pleasant result follows, probably the crying will not be repeated.

A little child derives great satisfaction from the attention of others. He soon begins to desire this attention in one form or another, and he soon finds out how he can get it. Smiles and nods of approval or "that's a good boy" are usually all that is needed to satisfy the child. But—and it is quite a big "but"—if he does not get a little attention in the form of praise when he is "good," he will surely try to get it by being "naughty." He may even prefer punishment to no attention at all. This desire for attention can be of the greatest use to the parents in teaching the child good habits.

The "Don't" Habit

Let him learn through experience, too. Whatever a child sees, hears, or feels is an experience through which he is enlarging his world and by which he is developing. By the time he is running about, his experience is enlarging very rapidly. He is curious about everything. Let him learn as far as possible by doing.

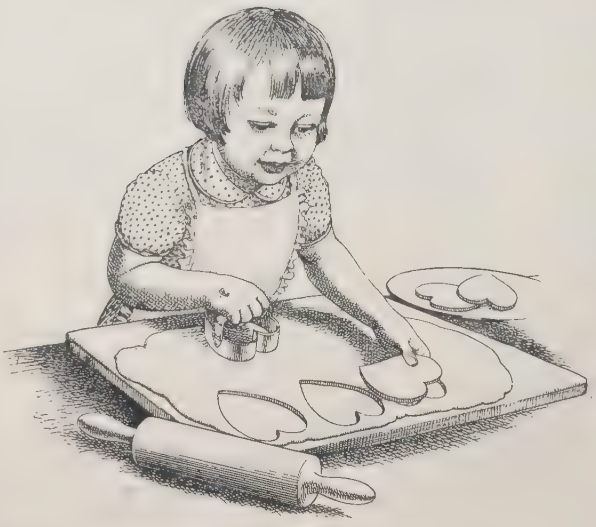
It is unfortunate when a child's home contains many things that he is not allowed to touch because they break easily or are costly. "Don't touch" may become a constant refrain when most of a child's time should be spent where he can touch. Parents would not dream of putting splints on a child's legs so that he could not move, but too many "don'ts" are splints for his mind. Curiosity is the best of teachers. Before saying "don't" to a child a parent should stop to think: "How often have I said 'don't' today? Were the occasions all equally and very important for his welfare, or am I developing the 'don't' habit?"

Questions and Imitation

Children should be encouraged to ask questions. It is well to teach a child not to interrupt, but his question should not be left unanswered—"Wait till Mother and Mrs. Brown have finished their talk and then she'll tell you." Sometimes continuous questioning is the child's method of getting attention, and then he needs careful handling. He must be urged to answer his own questions—"Stop and think, dear; perhaps you can tell **me** what Daddy is going to do with the hammer," or "go and see what Daddy is going to do." That encourages a child to think out his own problems and teaches him a new way of getting questions answered. It is certainly a much better way than telling him to keep quiet.

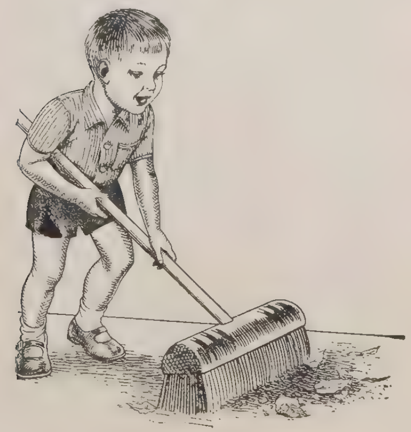
Imitation is as important a factor in a little child's development as

HOW A CHILD LEARNS



curiosity. Nearly everything a child does he has seen someone else do. He may refuse a food if he sees someone else refuse it, especially if the someone else is his father or a favourite uncle. He learns to slap by being slapped. He learns to be untruthful by hearing untruthfulness. He delights in sweeping the house or the paths, in rolling and cutting out biscuits, in ironing with a tiny iron, or mowing the lawn, all because he has seen grown-ups do similar things. Habits and manners of speech are acquired by imitation. "Thank you" and "please" are most used by the child who hears them used. A child talking over a toy telephone uses the very intonation and phrase he has heard used, whether they are of courtesy or of rudeness or ill-temper.

So, too, fears, likes, and dislikes are not inherited, but begin as imitations of the feelings of others. A child will be afraid of a spider or of a worm if he has seen his mother afraid of it. A child does not pick up bad habits any more quickly than he picks up good ones. It is the emphasis placed by the distressed parent on the bad one that fastens it the more firmly in the child's mind.



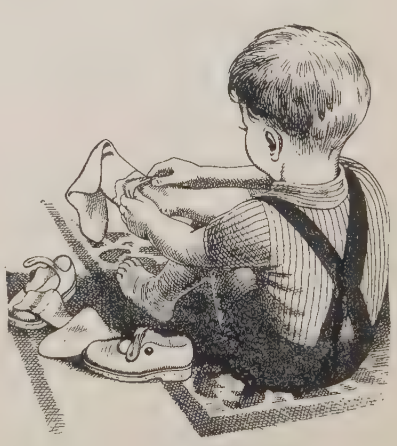
Dr. Kenneth Walker in his autobiography "I Talk of Dreams" shows the place of imitation in human development very well and from another angle: "We borrow when we imitate, and as the leaf insect reproduces the appearance of the leaf on which it lives, so do we imitate everything around us, taking our opinions from the Press, our religion from the Church, our laws from the Romans, and our British code of honour from the public schools. The greatest of all borrowers is the child, who, by imitating those around him, learns to think, to feel, and to act. Soon he learns to read, and then he borrows wildly from a whole new world of books. I tremble to think what debt or a grudge—I am not sure which—I owe to such writers as Henty, Manville Fenn, Gordon Stables, and Fenimore Cooper. I also feel called upon to express a belated apology to the editors of the "Boys' Own Paper" and of "Chums" for having purloined from their pages so many thoughts, sentiments, aspirations, and illusions."

Suggested Dislikes

Closely allied to imitation is suggestion. When a child shrinks from caterpillars or spiders because his mother does, or dislikes porridge or spinach because his father does, the adult has "suggested" this dislike to him, and he imitates the adult's feeling. It should be taken for granted—that is, suggested to him—that he will not cry when he tumbles, that he will eat what is given him, that he will go to bed without a fuss, and that he will do as he is told. A parent who expects trouble usually gets it. When a child is told "Come in this minute; it's your bath-time, and there's no use arguing," he feels tension in the air and disobedience is suggested. A warning 5 minutes previously that bath or dinner or bedtime is at hand helps a child. So does a remark such as: "As soon as you have run your train round once more, we are all going in to get ready for tea and a story."

Suggestions about behaviour are being given to children constantly. If that were realised fully, perhaps parents would not say some of the things they do before children. When a vegetable is being given to a child for the first time someone may say, "I wonder whether he will like this; I never did." A girl may hear her mother say: "I hope she won't cry when I take her to the doctor." And there is great surprise when the boy refuses the vegetable or the girl cries in the doctor's surgery.

Above all, a child must be given time to learn. One of the hardest things for parents is to let a child do things at his own pace, neither holding him back nor pushing him too fast. Time and patience are needed to sit by and let a 3-year-old try to do up his own shoes, but he is learning a new and complicated act, and he needs plenty of time to do it correctly.



"Don'ts" for Parents

There are a few "dont's" that really are applicable—but to parents, not to children:

- Don't hurry a child when he is learning.
- Don't force him into prolonged effort when he is tired. "You lace that shoe and I'll lace this one" is a good plan for a beginner.
- Don't call a child slow.
- Don't speak sharply about his mistakes. Let him see how it should be done, and let him try again tomorrow.

Above all, don't call him a "naughty" boy; say: "That was a naughty thing to do." Keep his tiny budding personality unentangled and the pathway of affection between his parents and himself always clear.

A
KNITTED JUMPER-CARDIGAN
for a
YOUNG GIRL

THE making of a jumper-cardigan, with short or long sleeves, which will be a handsome and useful addition to the wardrobe of the just-going-to-college-age girl is described in this article. The materials needed are 7oz. of 3-ply wool if the sleeves are to be short and 9oz. if they are to be long, 1 pair each of No. 9 and No. 12 knitting needles, and 9 buttons.

THE instructions given will produce a garment to fit a 32in. bust. The length from shoulder to lower edge is 18½in., the short sleeve seam is 5in., and the long sleeve seam 18in. The tension required is 7 stitches and 9 rows to 1in.

Abbreviations used are: K., knit; p., purl; st., stitch; inc., increase; dec., decrease.

The Back

Using No. 12 needles, cast on 109 sts. 1st row: * K. 1, p. 1, repeat from * ending k. 1. 2nd. row: * P. 1, k. 1, repeat from * ending p. 1. Repeat these two rows 15 times (32 rows altogether).

Change to No. 9 needles and pattern as follows—1st row: * P. 1, with point of right-hand needle lift 3rd st. from point of left-hand needle over the 2nd and 1st sts., k. the 1st st., wool forward, k. the 2nd st., p. 1, k. 3. Repeat from * ending p. 1, with point of right-hand needle lift 3rd st. from point of left-hand needle over the 2nd and 1st sts., k. the 1st st., wool forward, k. the 2nd st., p. 1. 2nd row: * K. 1, p. 3. Repeat from * ending k. 1. 3rd row: * P. 1, k. 3. Repeat from * ending p. 1. 4th row: * K. 1, p. 3. Repeat from * ending k. 1. These 4 rows form the pattern. Repeat the pattern 3 times more.

Inc. 1 st. at each end of the next row and every following 6th row 7 times, working the extra sts. into the pattern as the work proceeds (125 sts.). Continue in pattern until the back measures 12in. from the cast-on row, finishing after a 2nd row of pattern.

Shaping the armholes: Keeping in pattern, cast off 3 sts. at the beginning of the next 4 rows, then k. 2 sts. together at each end of the following 11 rows, leaving 91 sts. Continue in pattern without further shaping until the armholes measure 6½in. in depth.

Shaping the shoulders: Cast off 10 sts. at the beginning of each of the next 6 rows. Cast off the remainder.

Right Front

Using No. 12 needles, cast on 73 sts. Work 4 rows in rib as on the back of the jumper. Make a buttonhole as follows—Next row: * Rib 4, cast off 4, rib to end; following row: Rib to cast-off sts., cast on 4, rib 4. Work 10 rows rib. Repeat from * once more. Make the 3rd buttonhole in the next 2 rows. Work 2 more rows in rib.

Next row: Slip the first 12 sts. on to a safety-pin for the front border. Change to No. 9 needles and work 4 patterns as on the back. Inc. 1 st. at the end (side edge) of the next row and every following 6th row 7 times (69 sts.). Continue in pattern until the front measures 12in. from the beginning, finishing at the underarm.

Shaping the armhole: * Cast off 4 sts. at the beginning of the next row and finish the row. Work back to the armhole. Repeat from * twice more. Dec. 1 st. at the armhole edge on every row 9 times, leaving 48 sts. Continue in pattern until the armhole measures 5¼in. in depth, finishing at the front edge.

Shaping the neck: Cast off 4 sts. at the beginning of the next row and finish the row. Then dec. 1 st. at the back edge on every row until 32 sts. remain.

Shaping the shoulder: Cast off 10 sts. from the armhole edge twice, then cast off the remaining sts.

Slip the 12 sts. on the safety-pin on to a No. 12 needle; join on the wool. * Rib 20 rows. Make a buttonhole as before in the next 2 rows. Repeat from * until there are 9 buttonholes altogether. Work 2 more rib rows and cast off. Oversew the border to the front edge, easing the front to the border.

Left Front

Using No. 12 needles, cast on 73 sts. Work 32 rows in rib as for the right front. Change to No. 9 needles and repeat the first row of pattern over 61 sts., then slip the last 12 sts. on to a safety-pin. Continue in pattern over the 61 sts. until 4 patterns have been completed. Inc. 1 st. at the beginning (side edge) of the next row and every following 6th row 7 times (69 sts.). Finish to correspond with the right front by following the same directions.

Slip the 12 sts. on to a No. 12 needle and work a strip of k. 1, p. 1, the same length as the buttonhole border. Cast off. Oversew to the edge of the left front. Join the shoulders.

Short Sleeves

Using No. 12 needles, cast on 73 sts. Work in ribbing as on the lower edge of the back for 1½in., finishing after a 1st row. Change to No. 9 needles and inc. as follows—Next row: P. twice into every 6th st. (85 sts.). Proceed in pattern for 4 rows. Inc. 1 st. at each end of the next row and every following 4th row 6 times (97 sts.).

Shape the top. Cast off 4 sts. at the beginning of the next 2 rows, then k. 2 sts. together at each end of alternate rows until 51 sts. remain. Then cast off 5 sts. at the beginning of the next 4 rows. Cast off the remainder.

Long Sleeves

Begin on the cuff and, using No. 12 needles, cast on 61 sts. Repeat the 2 rows of ribbing as on the lower edge of the back of the jumper for 3in., finishing after a 1st row. Change to No. 9 needles and work 1 pattern. Inc. 1 st. at each end of the next row and every following 6th row until there are 87 sts., then at each end of every following 4th row until there are 97 sts. Continue straight until the sleeve measures 18in. from the beginning. Shape the top as for the short sleeve.

The Collar

Using No. 12 needles, cast on 31 sts. and work 13½in. in ribbing as worked at the beginning of the back. Cast off in rib.

Making Up

Omitting all ribbing, lightly press the work on the wrong side over a damp cloth. Sew the tops of the sleeves into the armholes. Join underarm and side edges. Stitch one edge of the collar round the neck, starting and finishing ½in. from the extreme edge of each front border. Sew on the buttons.

The Nutritive Value of Cereals and Dairy Products

By EVELYN E. MOORE, Rural Sociologist, Department of Agriculture, Auckland.

FOODS vary greatly in their nutrient content. In olden times, when the choice of foods was generally small, it happened that many races chose a diet of high nutritive value. Now the great variety of foods which modern transport and methods of food processing have made available makes it necessary to ensure that the many foods of low nutritive value—but of enticing flavour and palatability—do not oust from their rightful place in the diet those ordinary but nutritious foods on which every healthful dietary is based.

NATURALLY these "basic" foodstuffs vary somewhat between nations—the Scottish prefer oatmeal, the Chinese rice, which are cereals of comparable nutritive value. Consequently the dietary should conform to the family's tastes as far as is practicable; sudden changes in methods of cookery or in the nature of the food are likely to be strenuously resisted. As Belloc has pointed out:—

> And all the world is torn and rent
> By varying views on nutriment.
> Alas! What various tastes in food
> Divide the human brotherhood!
> Birds in their little nests agree
> With Chinamen but not with me.
> Colonials like their oysters hot,
> Their omelettes heavy—I do not.
> The French are fond of slugs and frogs,
> The Siamese eat puppy dogs—

Some foods, however, because of their excellent nutritive value, are recommended as an adjunct to any diet; others have obtained reputations, arising perhaps from racial and religious prejudices or from some of the dietary cults such as vegetarianism, quite at variance with their true nutritive value. In addition, though many housewives may feel that the introduction of vitamins or minerals into a discussion of food values needlessly complicates the subject, and may maintain that their parents managed quite well without such knowledge, few would deny that, when careful scientific experiment has shown the limitations or advantages of some common foodstuffs as articles of diet, it is wise to use such knowledge when planning everyday meals.

Consequently, though a good deal has been said in previous articles, incidentally or by way of illustration, of the nutrients in foods, a consideration of their good and bad points, as well as the effect of cooking on their nutritive value, may not be amiss.

Virtues and Deficiencies of Cereals

Cereals probably deserve a prior place among the groups of foods which make up the daily menu, for they not only provide the bulk of the calories (or energy value of food) eaten by most people, but are easily the main agricultural crops in the world. Among the peasant populations of Asia and parts of Europe they are practically the only foods eaten.

Though the calorie value of food is of the first importance, calories without the means to use them—that is, the essential food nutrients, minerals, vitamins, and proteins—are, like a car with petrol but no oil for lubrication, almost useless, and foods with only calorie value support life for a very short time.

Thus cereals, though generally a mainstay of civilisation, are by themselves nutritionally rather poor foods, whether refined or not. In other words, the nutritional problems of mankind are not to be solved solely by the eating of wholemeal bread instead of white bread.

In New Zealand only two cereals, wheat and oats, are eaten in sufficient amounts to affect the nutritional value of the diet, and they are probably the aristocrats of the cereals in the field of nutritive value. However, even whole wheat or oatmeal have the following faults:

They are deficient in high-quality protein, which is needed especially for growth.

They contain very little fat, a certain amount of which is essential for health.

Not only do they contain very little calcium, but whole wheat and oatmeal contain a substance which prevents the calcium, and possibly some of the iron present in these cereals, from being used by the body.

They are completely lacking in vitamins A, C, and D.

On the other hand, cereals are good sources of iron and the B group of vitamins, the amount present in cereal foods depending on the degree of refinement and sometimes on the method of cookery; because of their high starch content they are cheap and rich calorie foods; and they supply some protein, of a quality inferior to that in meat and other animal foods, but nevertheless able to be used as a supplement when these foods are scarce. These factors, as well as their general popularity as food, will ensure their position as one of the basic foodstuffs in the diet of people everywhere, and it seems possible, too, that for some years at least a compromise will have to be made between a degree of refinement which will give a product with good baking and keeping qualities and one which has a high nutritive value, with a tendency to use whole-grain cereals in periods of food scarcity.

Constituents of Wheat

Wheat flour, in bread, scones, and cakes and as the main constituent of many of the favourite puddings of the New Zealander, is so much a part of everyday life that any suggestion of rationing it would cause the utmost dismay. Even the introduction of 80 per cent.-extraction flour caused much criticism, and probably many people, determined to regard all bread that lacks the former pristine whiteness with disfavour, will consider the 2 per cent. reduction in extraction rate, which is expected to cause an improvement in flour quality, a most inadequate step toward a return to pre-war conditions. Others may regard it as a retrograde step under the impression that the use of other than wholemeal bread and wholemeal cakes or biscuits is largely responsible for the ill health and the high rate of tooth decay of New Zealanders.

To understand the arguments for and against the use of wholemeal bread or flour it is necessary to know something of the structure and chemical composition of the wheat grain. On the outside are several layers of bran, the inner ones, called the aleurone layers, containing less fibre than the outside layers. Inside is the germ or wheat embryo, separated from the kernel or endosperm, which is used to make white flour, semolina, macaroni, and other products, by a thin membrane called the scutellum. About 13 or 14 per cent. of the weight of the wheat grain is bran, another 2 per cent is germ, and the kernel makes up most of the remainder.

The scutellum, which is only about 1 per cent. of the weight of the grain, nevertheless is very important nutritionally, for it contains more than half the total vitamin B_1 in the wheat.

The inner part of the endosperm, though about three-quarters of the total wheat grain, contains less than a tenth of the total amount of vitamin B_1 and correspondingly less of the other important minerals and vitamins.

The bran, though containing more vitamins and mineral and better-quality protein than the endosperm, contains a fair proportion of indigestible fibre which some people claim to be important as a preventive of constipation. That is partly true, but bran is not necessary to prevent constipation, for if fruit and vegetables are eaten in amounts compatible with good health, they will supply sufficient fibre—and fibre of a less irritating nature than that present in bran—to prevent constipation. In addition, bran contains a substance which makes unavailable to the body some of the important mineral calcium in the other foods eaten. If more than a pint of milk is consumed each day, this is unimportant, the calcium in the extra milk being a safeguard against the loss caused by the substance (phytic acid) present in bran. Bran is also important as stock and poultry feed, and the cellulose present is able to be digested and used as food by cattle.

Wheat germ, because it contains fat, goes rancid fairly quickly—in fact, that is one reason why whole-wheat flour does not keep as well as white flour. It is a very good source of the B group of vitamins, as well as of vitamin E, which, though it has been in the news recently allegedly as an aid to the cure of some complaints of the heart and blood vessels, is stated in authoritative medical journals not to possess this property. As it has never been shown that a deficiency of vitamin E is the cause of any illness in Man, it is probable that Man is either able to make his own vitamin E or that all but the most inadequate diets contain sufficient for his needs. Therefore, the advisability of including wheat germ in the diet to provide vitamin E remains at present a subject for conjecture.

Flour-extraction Rate

Consequently, the aim has been to produce a flour which contains as high a proportion as possible of the nutritionally-important scutellum and aleurone layers of the bran and yet has a low percentage of the unwanted fat from the germ and of the less digestible bran, which often can be used more profitably as stock feed. It is important also that the baking quality of the flour be reasonably good, or its purpose, which is generally to improve the nutritive quality of the diet, will be defeated because people will eat less, perhaps even substituting less nutritious foods for it.

Baking quality is an important factor in the manufacture of wholemeal bread and flour. Varieties of wheat which make wholemeal flour with good baking qualities are usually chosen and blended especially for baking wholemeal or brown bread, and the whole of the wheat grain is seldom included in wholemeal flour, the coarsest and most indigestible bran particles with the poorest baking qualities being left out. The result is a wholemeal extraction rate usually about 92 or 93 per cent. (The extraction rate is the percentage of the whole wheat made into flour.)

After careful consideration, an extraction rate for white flour has been chosen which provides as nearly as possible the good qualities of both wholemeal and the old white flour—that is, the baking and keeping qualities and digestibility approach

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Upper photograph on opposite page by Sparrow Industrial Pictures Ltd.; lower by Neuline Film Studios Ltd.

those of white flour, so that there is little waste, and, as the scutellum is mostly retained, there is nearly twice as much vitamin B_1 present (about half the amount present in wholemeal) and up to 1½ times as much iron, riboflavin or vitamin B_2, and niacin.

Therefore, a return to pre-war white flour (72 to 73 per cent. extraction) would certainly be retrograde in its effect on the nutrition of the community, more than offsetting any advantages which might accrue from the better keeping qualities of bread made from it.

Other arguments—for example, that the bran gained by using 72 to 73 per cent.-extraction flour is more valuable as poultry food—are difficult to substantiate. The conversion of feed into eggs is not very efficient even in the best of hens, and if Man must choose between eggs and white flour and no eggs and 78 per cent.-extraction flour, he will obtain more nourishment by eating the bread made from the richer flour.

Though 78 per cent.-extraction flour is nutritionally superior to 72 per cent.-extraction flour, it remains incontestable that wholemeal contains more of all the vitamins known to be present in wheat, though it has a slightly-lower energy value. Therefore, until it has been shown that 78 per cent.-extraction flour can substitute fully for wholemeal in a well-balanced diet, the nutritionist probably will continue to recommend that some wholemeal bread be eaten daily, particularly as the coarsest and most indigestible bran fractions usually have been removed from the flour.

Oats

Oats are similar to wheat in nutritive value. They contain more of some nutrients, such as vitamin B_1, but less of others, and most notably more of the substance which makes some of the calcium in food unavailable.

Cereals Require Supplementing

Cereals are excellent energy providers, but as they are deficient in calcium, first-quality protein, and vitamins A and C, they require supplementing with fruits, vegetables, and milk and other dairy products.

Refined cereals and the whole-grain cereals which have been cooked at high temperatures (wheat flakes, puffed wheat, and other ready-to-eat breakfast cereals), as well as lacking the nutrients mentioned, contain inadequate amounts of the B group of vitamins and very often of iron, so should be used only sparingly or in combination with rich sources of vitamins, calcium, and protein.

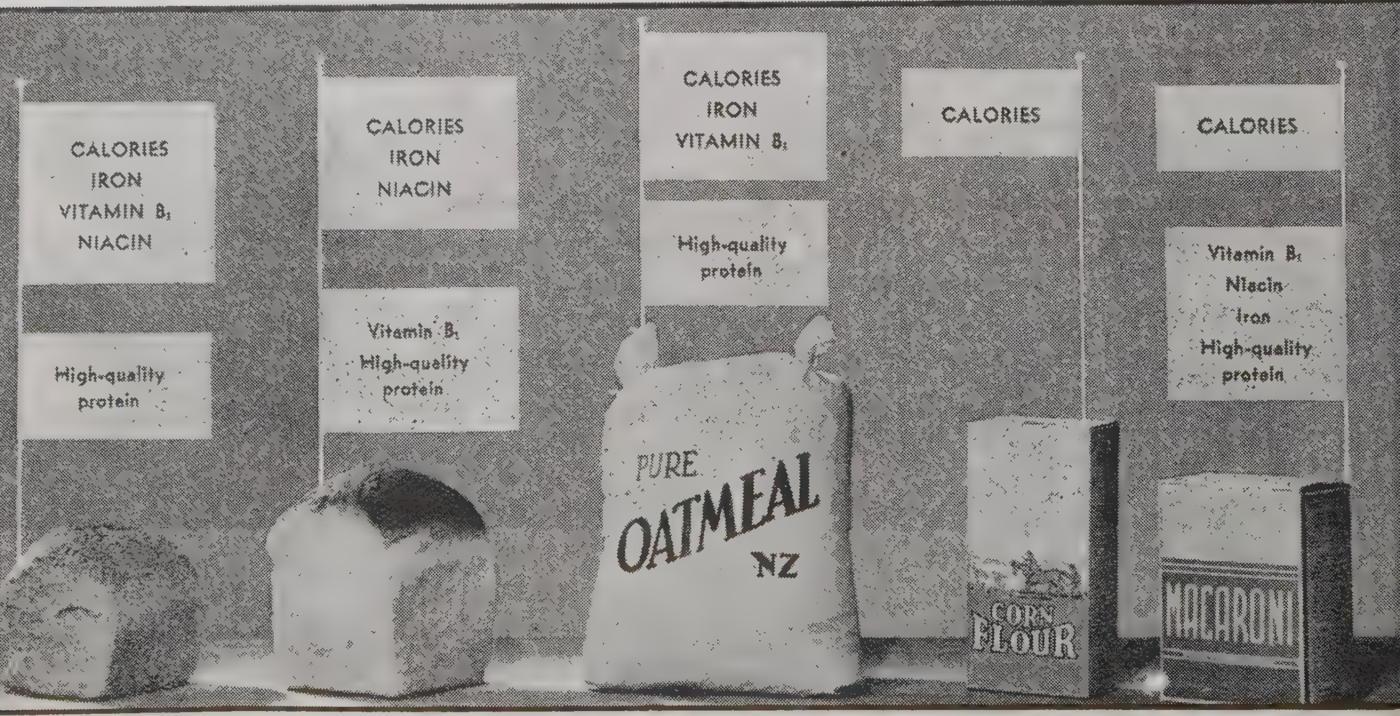
Milk's Unique Nutritional Value

Though milk is inferior to cereals as an energy provider, it easily surpasses them in its content of protein and minerals essential for health and therefore more than compensates for its higher cost. Other dairy products, though of varying nutritive value, contain at least some of the vitamins or minerals which make milk so valuable as a food.

One topic on which all dietitians are agreed is the unique value of milk in the nutrition of every human being, no matter of what age. In fact, one American nutritionist claims that the dairy-fed nations are the progressive ones.

The percentage of fat in milk is at least one side of nutrition on which the New Zealand dairy farmer is well informed, for it is of considerable importance to his prosperity—indeed, probably few New Zealanders do not take some interest in the amount of cream on top of the jug of milk in the morning. The importance of producing high-quality cheese has also made the dairy farmer, at least, aware of the protein content of milk and its effect on the quality of cheese. The nutritionist is equally concerned with these subjects, and the tendency—commoner perhaps in countries other than New Zealand—to breed for town-milk supply cattle which will produce large quantities of milk which barely conforms with the minimum standards for fat and total solid content is to be deplored.

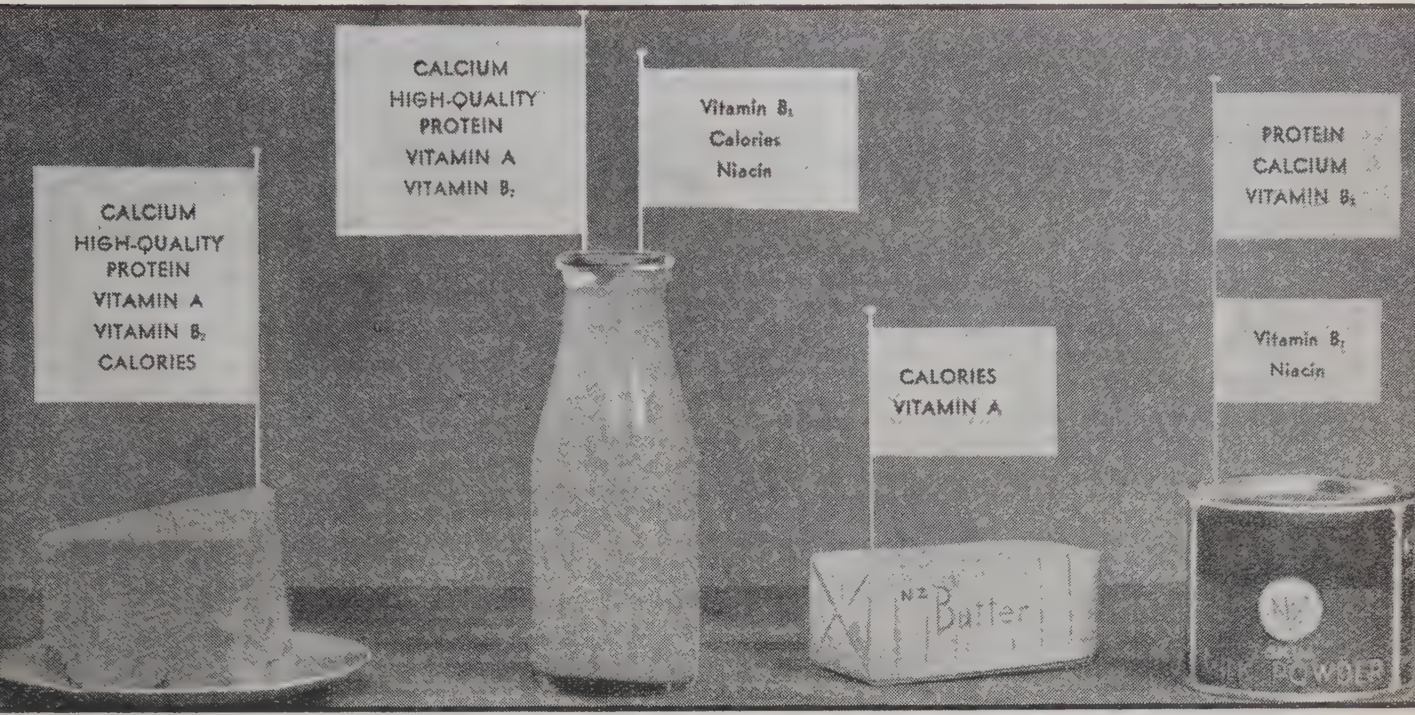
Nutritionally the most important constituent of milk is calcium, for though fat and protein can be obtained readily from many other foods, milk is



[*Sparrow Industrial Pictures Ltd. photo.*

The nutritive value of wholemeal bread, bread made with 78 per cent.-extraction flour, and other cereals. A large label indicates that the food is a good source of the nutrient, a small label that it is a fair source. Calories provide energy, iron benefits the red blood cells, vitamin B_1 is necessary for healthy body cells and normal appetite, niacin promotes health, and high-quality protein encourages growth.

NUTRITIVE VALUE OF CEREALS AND DAIRY PRODUCE



[*Sparrow Industrial Pictures Ltd. photo.*

The nutritive value of milk and some milk products. A large label indicates that the food is a good source of the nutrient, a small one that it is a fair source. Calcium promotes strength of bones and teeth, vitamin A assists the health of the skin and eyesight, and vitamin B_2 also contributes to the health of the skin and general health.

certainly the best source of calcium in most diets. Most of the vitamins are present in milk, too, it being a very good source of vitamin B_2 or riboflavin. Very fresh milk contains vitamin C, but it is lost quite quickly on standing even when chilled, so that, except in the country when milk is drunk within an hour or two of milking, it cannot be regarded as a source of this vitamin.

Apart from its low energy value and lack of vitamin C, however, milk has another disadvantage as a complete food: It contains practically no iron. That is why it is necessary for babies to receive supplementary feeding with egg yolk and vegetable purees after they have reached the age of 6 months, as egg yolk especially is a good source of iron. As the normal child is born with a good store of iron in its body, it is not necessary that supplementary feeding with egg yolk be started earlier.

Food Value of Cheese

Cheese contains nearly all the nutrients present in milk and in a much more concentrated form—1oz. of cheese has about 6 times the energy value of 1oz. of milk or 1½ times the energy value of bread. Its content of other nutrients is correspondingly increased, so that cheese is one of the best food sources of protein, fat, calcium, and vitamins A and B_2. Proportionately it has a much higher food value than meat and, except that it contains only a small amount of iron, is in most respects more nutritious than eggs.

Skimmed Milk is Valuable

The forthcoming change to dried-milk production in some New Zealand dairy factories will be regarded by many nutritionists as a forward step, especially if it enables some skimmed milk to be saved for human consumption and for sending to Britain. Skimmed milk is a valuable food, lacking only fat and vitamin A, of which there are many alternative sources; green vegetables, tomatoes, and carrots all provide vitamin A, and meat fat, eggs, nuts, and vegetable fats and margarine provide fat of a calorie value equal to that in butter.

On the other hand, it contains the calcium, the B group of vitamins, and protein from whole milk—nutrients which are often more difficult to replace than vitamin A and fat. Because it has low energy value combined with high nutrient value, it is also an important ingredient of the weight-reducing diet.

Butter cannot Replace Milk

Butter is undoubtedly the most popular fat in the New Zealander's diet—perhaps fortunately so, for certainly it is the most nutritious of the common culinary fats and oils, containing appreciable amounts of vitamin A (1 tablespoonful contains about a seventh of the daily requirement of this vitamin) and a small amount of vitamin D.

It cannot be regarded as a substitute for milk. Milk can be rated as a good source of five nutrients—calcium, protein, phosphorus, and vitamins A and B—and a fair source of two nutrients and of calories or energy, but butter is a good source of only vitamin A and calories and contains no calcium, an essential mineral lacking in many foods other than milk. In Great Britain, where every ounce of food produced is used to the fullest possible extent, butter production is discouraged and the consumption of more whole milk advocated.

Complementary Foods

The nutritive value of these two of the most important classes of foodstuffs—cereals and dairy products—shows that, though they are valuable foods to include in any dietary, neither is perfect alone. However, together they complement each other, and, in fact, the traditional porridge and milk, milk pudding, or bread, butter, and cheese have much to commend them after all. Porridge provides the energy, vitamin B_1, and iron, and milk or cheese the high-quality protein, calcium, vitamin A, and vitamin B_2.

Other vitamins, especially vitamin C, and more iron are needed too. Following articles will discuss foods which provide vitamin C, as well as the contributions to the needs of the body of other well-known foodstuffs.

Quick-frozen Foods for Suppers

By EVA TOPPING, Rural Sociologist,
Department of Agriculture, Auckland.

A NEW department is appearing in many town food shops, the quick-frozen foods counter, where frozen fruits, vegetables, and some kinds of fish prepared for cooking may be bought. Country hostesses in search of specialities for a party supper or other festivities will find these packages of frozen foods valuable. Quick-frozen vegetables, being ready for the pot, are especially useful after the housewife has spent a day in town and the evening meal has therefore to be on the table in a hurry.

ACCORDING to an authority, "Quick freezing is the best food preservative method yet designed because it interferes least with Nature by not disturbing the food's cell structures. In this way the nutritional value, flavour, colour, texture, and even the bloom of the product are maintained."

As quick freezing cannot improve the quality of the raw product, food for quick or deep freezing must be of the best quality and quite fresh; for this reason one of the two firms who undertake the process in New Zealand has constructed a mobile unit which is taken to the source of the product to be frozen—to the seashore when crayfish is to be prepared, to a market garden centre when peas and beans are in season.

Some idea of the process can be gained by an explanation of the method of preparing peas. First they are put through a viner, which shells them, then they are graded by immersion in a brine solution. Next they are blanched for a few minutes to stop enzyme action which might cause spoilage. Peas are frozen by air blast of many degrees below zero F., which freezes the peas separately without damaging the texture, appearance, flavour, or vitamin value. They are then packed, first in cellophane wrappers, which are sealed by heat, then in waxed cartons, and finally the carton is wrapped in wax paper, which is also heat sealed.

The packages are kept in a holding room at a temperature slightly below zero F. When required for retailing the packages are conveyed by refrigerated lorries, ships, and occasionally aeroplanes. The retailers hold the packaged frozen foods in special refrigerated cabinets. When purchased the food will remain frozen for several hours, according, of course, to the weather. Thus a carton of frozen food bought in town and taken home to the farm, even though the journey may be fairly long, will remain frozen and can be either used at once or temporarily stored in the household refrigerator.

If placed in the ice cube compartment, unopened packages may be kept safely for several weeks.

Products which have been included in the list of quick-frozen foods are:—

Vegetables: Asparagus, beans, beetroot (cooked before being frozen), brussels sprouts, cauliflower, carrots, parsnips, peas, spinach, silver beet, sweet corn, and mushrooms.

Fruits: Boysenberries, whole strawberries and strawberry puree, early rhubarb, tree tomatoes, passion fruit, peaches, apricots, raspberries, nectarines, and plums.

BELOW: Savouries and sweets made with quick-frozen food from recipes given in this article. The patties are whitebait and green peas and carrot. Photographs by Sparrow Industrial Pictures Ltd.

and Hurriedly-prepared Meals

Fish: Crayfish tails (uncooked), crayfish legs (cooked), eels, swordfish steaks, Stewart Island oysters, whitebait, flounder, and mussels.

Most fruits are dipped in syrup before they are frozen to prevent discoloration and when thawed the sugar, having penetrated the flesh, leaves the fruit sufficiently sweetened for most tastes. Strawberry puree is also frozen and is useful for cooked desserts such as shortcakes, trifles, and pies.

Cooking Frozen Vegetables

Cooking quick-frozen vegetables to conserve the colour, flavour, and vitamins is similar to cooking fresh vegetables, except that the frozen kind cook more quickly. Most frozen vegetables should be cooked **without thawing**. One exception is corn on the cob, which must be completely thawed first; otherwise the corn will be cooked, but the cob, through which the heat will not have penetrated, will remain partially frozen and will quickly cool the corn, which then will not be hot and palatable when served. Greens such as spinach and silver beet are frozen in a solid pack, so these vegetables should be **partially thawed**, just enough to separate the leaves, so that even cooking is assured.

Once the vegetable (or any other food) has been thawed it must be used. None of these foods must ever be refrozen, as this results in breaking down of the cells and texture.

Bring salted water to the boil quickly; ¼ to ½ cup of water is usually enough for 4 to 5 servings, but the amount depends on the size of the package and the length of time needed to cook the vegetables until tender. Add the frozen vegetables, put on the lid, and bring back to the boil quickly. Reduce the heat, but keep the water boiling steadily and cook until the vegetables are just tender. Overcooking destroys the flavour and texture, so it is important to remember that as most frozen vegetables are partially cooked in the blanching process before being frozen, they cook in a shorter time than fresh ones. **It is very easy to overcook frozen vegetables.** The approximate cooking times for frozen vegetables are as follows:—

Asparagus	8 to 10 minutes
Beans, sliced	6 to 8 minutes
Beans, french, cut	8 to 10 minutes
Brussels sprouts	3 to 5 minutes
Cauliflower	3 to 5 minutes
Carrots	4 to 6 minutes
Parsnips	6 to 8 minutes
Peas	4 to 6 minutes
Spinach, partially thawed	4 to 6 minutes
Silver beet, partially thawed	4 to 6 minutes
Sweet corn, completely thawed	10 minutes' rapid boil

Beetroot, being ready cooked, needs only complete thawing before use.

Frozen Fruits

When thawed most fruits are ready to use for dessert, but only sufficient for one meal should be thawed, as the fruit soon loses its texture, becoming too soft, and the fresh flavour decreases. If a package is too large, divide its contents and thaw only the portion required; the rest, wrapped carefully, will keep frozen in the refrigerator if stored in the ice tray compartment.

Leave the fruit in the container while it is thawing. Those fruits prepared with syrup should be turned several times to keep the fruits evenly coated. At room temperature thawing will take from 3 to 5 hours.

Never refreeze fruit once it has been thawed; any left over should be stewed and used for cooked dessert dishes.

Frozen Fish

All fish needs to be thawed before using. Snapper fillets should be thawed and then used in the same way as fresh fish. Whitebait can be made into fritters or creamed, and oysters can be used in all the usual ways, fritters, soup, patties, etc.

Crayfish tails are not cooked before being frozen, so they should be steamed or baked. To bake a crayfish tail split it down the centre, put it into a fairly hot oven (400 degrees F.), and bake it for 30 to 40 minutes, depending on its size. Baste it with melted butter and add salt and pepper. When cooked the flesh will be white, tender, and slightly shrunken from the shell, which will have changed its colour to the familiar bright red.

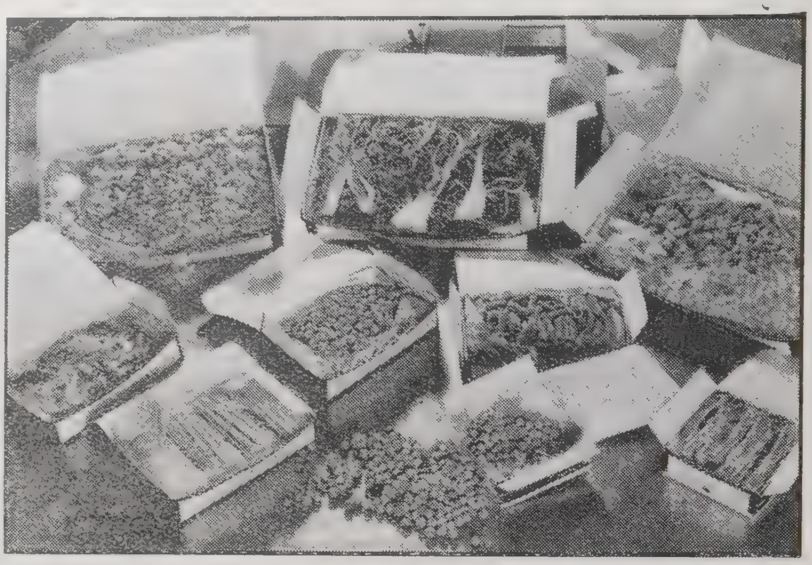
Buffet Supper

The illustrations on the two previous pages show a buffet supper with many delicacies made from quick-frozen foods. Here is the bill of fare and methods of using some frozen foods:—

Hot savouries: Creamed whitebait patties; green pea and carrot patties.

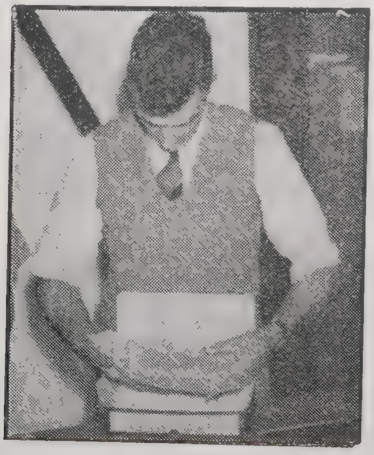
Cold savouries: Asparagus rolls; crayfish salads.

Sweets: Strawberries and ice cream; boysenberry tartlets.



[*Sparrow Industrial Pictures Ltd. photo.*

Quick-frozen vegetables, showing method of packing. Top row, from left—Peas and diced carrots, silver beet, diced carrots. Middle row—Sliced beetroot, green peas, french beans. Bottom row—Sweet corn, green peas, asparagus.



[*Neuline Film Studios Ltd. photo.*

Packing quick-frozen peas.

Recipes

Creamed Whitebait Patties

Thaw the whitebait and cook it gently in a very small quantity of milk. Make a thick white sauce using flour, butter, and milk. (Directions for making white sauce were given on page 413 of the April, 1949, issue of the "Journal.") Stir the cooked whitebait into the sauce. Split pastry cases, fill them with the whitebait mixture, put "lids" on them, and heat them thoroughly just before serving.

Green Pea and Carrot Patties

Make sufficient small pastry shells. Cook the package of peas and carrots as already described. Make a thick white sauce and add grated cheese to taste. Stir in the drained peas and carrots. Fill the pastry shells and heat them until the vegetable mixture is **lightly** browned on top.

Asparagus Rolls

Put the quick-frozen asparagus into rapidly-boiling, salted water, bring it to the boil, and cook it for 8 to 10 minutes. Remove the crusts from a small loaf and cut wafer-thin slices of buttered bread. Roll the asparagus in just sufficient bread to cover it. Garnish the serving plate with asparagus tips.

Crayfish Salads

Cook the crayfish tails and cool them thoroughly. Thaw the beetroot and sprinkle it with a little vinegar. Cook frozen peas, beans, or peas and carrots and allow them to cool. Fill lettuce leaves with a mixture of vegetables and flaked crayfish. Add a little mayonnaise dressing; if too much dressing is added, the salads are difficult to handle.

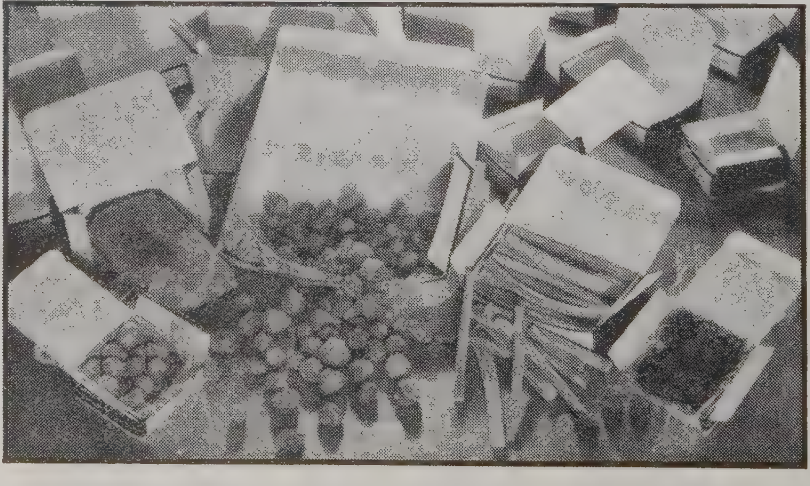
Strawberries and Ice Cream

Thaw the strawberries, turning the package occasionally during the process to keep the syrup evenly distributed. Set the ice cream on individual serving plates and arrange strawberries round it.

Boysenberry Tartlets

8oz. of flour
4oz. of butter
2 flat tablespoons of sugar

Cream the butter and sugar until they are very soft and add the flour gradually by kneading it with the hands. Roll the mixture out thinly, cut it into rounds, and line patty-pan tins with it. Bake the shells in a moderate oven until they are lightly browned. Cool them, then in each put 1 teaspoon of sweetened, whipped mock cream. Set two boysenberries on top of the cream and put a little cream between the boysenberries. Sprinkle the tartlets with icing sugar. If the tartlets are filled several hours before they are required, it is better not to thaw the berries or they may become a little too soft.



[*Sparrow Industrial Pictures Ltd. photo.*

Quick-frozen strawberries, strawberry puree, rhubarb, and boysenberries.

FISH AND VEGETABLE CROQUETTES SERVED WITH CHIPPED POTATOES

DEEP-FAT FRYING

DEEP-FAT frying is not a cooking method to be used every day, but it produces results in taste and texture which are not obtainable in any other way. Therefore the good cook will master the principles and technique so that when occasion demands she can produce potato chips, croquettes from left-overs, and doughnuts (American style with holes or English style without) which will be golden brown and tempting, not the unappetising greasy lumps which make many people shudder at the mention of fried foods. Different types of fat to use, the judging of temperatures, and correct methods for frying foods of various kinds are the subject of this article by Norma K. Metson, Rural Sociologist, Department of Agriculture, Wellington.

FAT for deep-fat frying should be clean, of a type that will not burn readily, and without a pronounced flavour. The contents of the usual dripping tin, a mixture of beef and mutton fats, are quite suitable, provided they are clean and fresh. Fat with strong flavours and odours, such as result from cooking sausages or onions, should not be used. If it is discoloured with burnt pieces and drippings, it should be clarified. To do this scrape any sediment from the bottom of the solid fat, tnen melt the fat slowly, adding 1 medium-sized sliced potato for each 1lb. of fat. When the fat has ceased to bubble and the potato slices are well browned, strain the fat through several layers of butter muslin placed over a strainer, wait until it solidifies, then scrape the bottom again. Freshly-rendered fat is preferable, and this too should be strained before and scraped after it has set.

Unfortunately dripping burns rather easily and some people object to the flavour; pure lard and solid vegetable fat do not have these disadvantages. Lard smokes unpleasantly if overheated, but vegetable fat smokes or burns only at very high temperatures. If these fats are strained after use, kept in a cool, dry place, and not contaminated with drippings or fat from other cooking, they can be used for deep-fat frying for a long period.

Oils can also be used. Pure olive oil, though traditional in some forms of cookery, is now too expensive, but substitutes such as peanut, soya, or cotton-seed oil are quite as effective and have a less pronounced flavour. However, the use of oil for frying is not common in New Zealand.

Equipment and Procedure

A heavy saucepan to hold the fat, a long-handled spoon and fork for lifting foods in and out and turning them while they are cooking, and a large dish with crumpled soft paper on which to drain the food are essential. A wire basket in which the food is placed, fitting loosely into the saucepan, is a great convenience and simplifies handling the food, especially when there are many

DEEP-FAT FRYING . . .

small pieces such as potato chips. A cooking thermometer which reads up to 500 degrees F. and can be clamped over the side of the pot with the bulb in the fat indicates the correct temperature at which to begin frying, though this can be judged or tested in other ways.

Heat the fat slowly. A depth of 2 to 3in. is sufficient—about 2lb. of fat for a medium-sized pot. The saucepan should never be more than three-quarters full or the bubbling which is caused by the evaporation of water when the food is put in may make the fat overflow and catch fire.

Testing for Temperature

To test the temperature of the fat, drop in 1in. cubes of bread. If the cube browns in 60 seconds, the lowest frying temperature has been reached—350 to 365 degrees F., suitable for uncooked batters and doughs in small pieces. When browning takes 40 seconds the temperature is 365 to 380 degrees, at which previously-cooked and made-up foods such as croquettes and fish balls are fried. At the highest temperature, 380 to 390 degrees, the bread cube takes only 20 seconds to brown; this is correct for potato chips and large pieces of uncooked foods—for example, crumbed chops, or fish in batter. Above 400 degrees fat begins to burn and smoke unpleasantly. With experience the time taken for the fat to heat to these temperatures will be learnt; appearance and the initial reaction when the bread or a small piece of the food is put in are also an indication.

The correct temperature is very important, for if the fat is too hot, the food is burnt on the outside and raw inside; if the temperature is too low, fat soaks into the food, which becomes greasy and does not cook properly, turning a pathetic pale colour instead of a rich golden brown.

Cooking and Serving

So that correct temperature is maintained, the saucepan should never be crowded with food; put in only small amounts at a time. After each lot has been taken out time must be allowed for the fat to return to the original temperature before more food is added. Most foods require to be turned during cooking, and this must be done carefully, with spoon and fork, to avoid breaking the crisp covering which has formed round the food and prevents the penetration of fat. When first put in the food will sink in the fat; as it cooks and moisture is expelled it will rise to the surface.

If the food is to retain its crisp, attractive appearance, it must be drained on soft, absorbent paper immediately it is taken from the pan to absorb the surplus fat. Ideally, fried foods should be eaten immediately they are ready, but that is not usually possible at a family meal. After being drained the food should be transferred to another paper-lined dish and kept in a heated oven until serving time.

Recipes

Methods of coating food with egg and crumbs and of making batters for fish were given in an article on fish cooking in the May "Journal." Here are some other recipes for deep-fat frying:—

Batter for Fruit Fritters

1⅓ cups of sifted flour
¼ teaspoon of salt
2 teaspoons of baking powder
2 tablespoons of sugar
1 egg
2/3 cup of milk

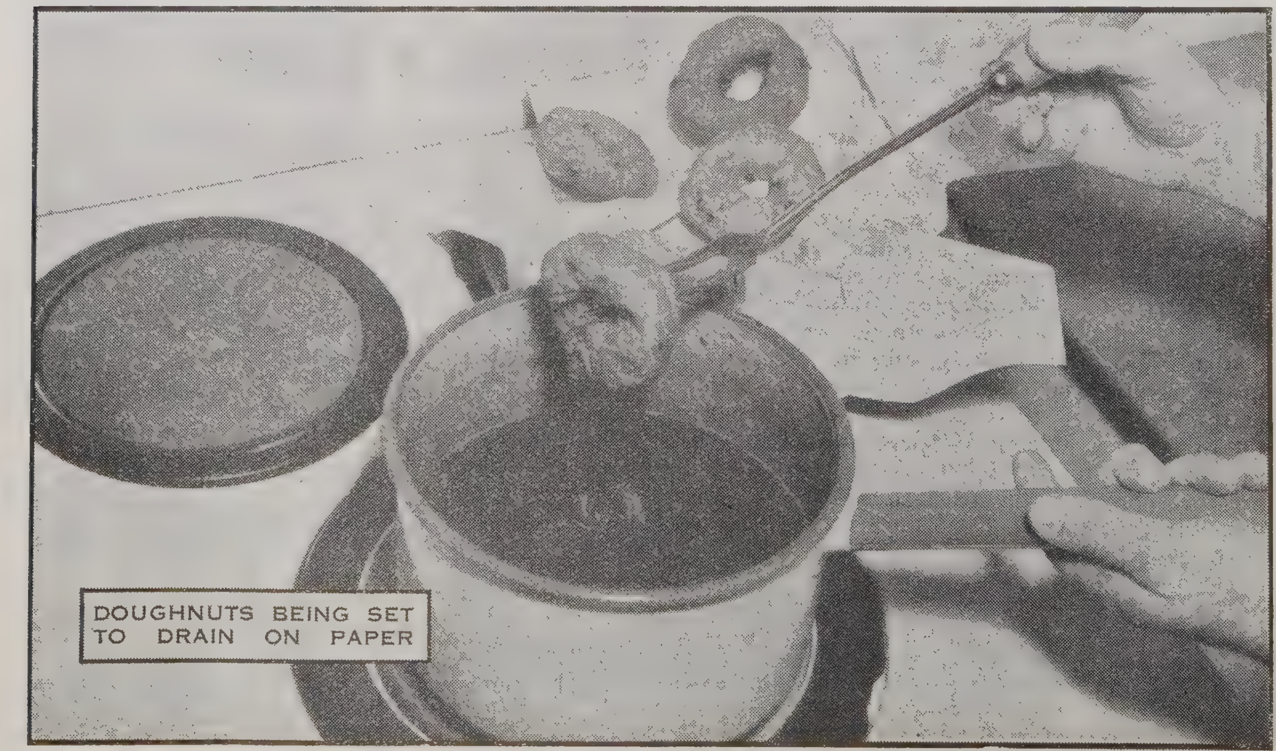
Sift the dry ingredients and add the well-beaten egg and milk. The batter should be just thick enough to coat the food. Try it out and, if necessary, add a little more flour or a little more milk.

Apples and bananas are favourite fruits for fritters, but peach or apricot halves, orange slices, quartered pears, and other fruits may be used. Fry at 365 degrees for 2 to 3 minutes. For bananas use a thicker batter and cook a little longer.

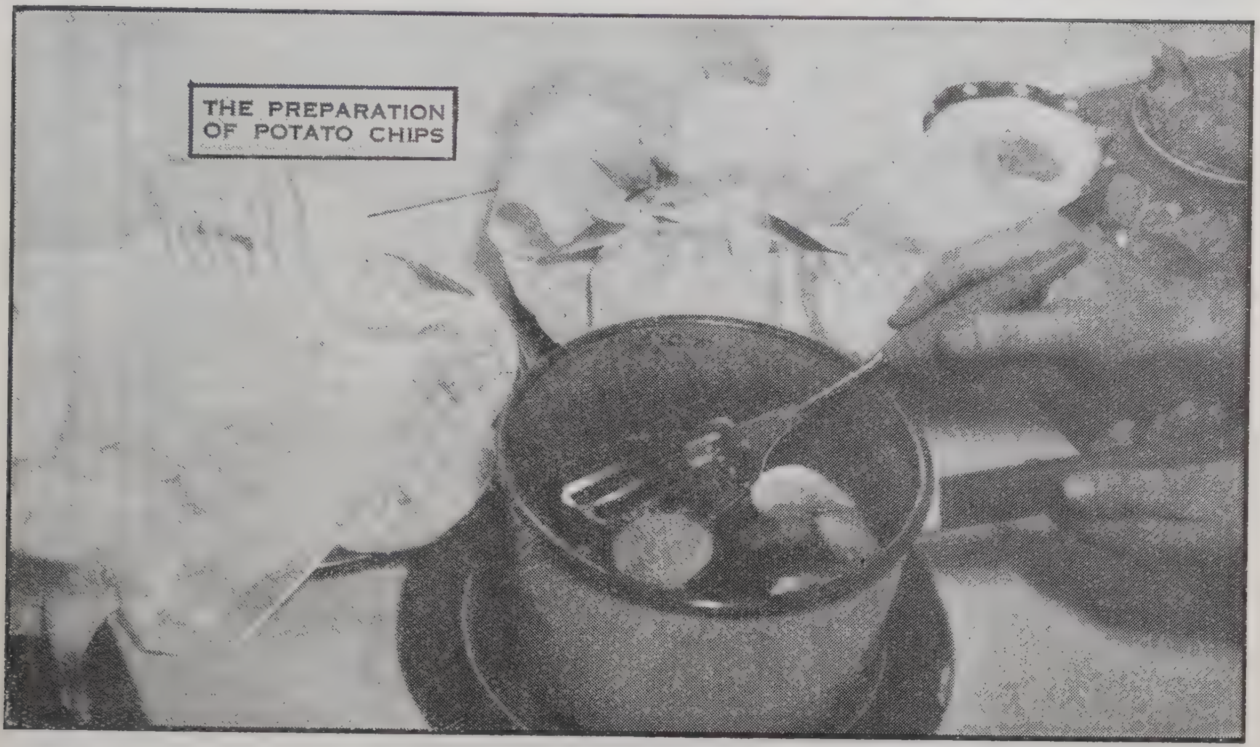
Doughnuts (American style with yeast batter)

½ cake of compressed yeast
¼ cup of luke-warm water
1 cup of scalded milk
1 teaspoon of salt
¾ cup of sugar
2 tablespoons of butter
4 cups of sifted flour
1 egg
¼ teaspoon of nutmeg

Add the salt, sugar, and butter to the scalded milk. When it is lukewarm mix in the yeast, softened in the water. Add 1½ cups of flour, beat the mixture, then leave it to rise in a warm place until it is full of bubbles and very light. Add the remainder of the flour, beating it in, then knead the dough well. Keep the dough as soft as possible—so that it can just be handled. Return the dough to the basin, cover it, and leave it in a warm place to rise until its bulk has doubled. Turn it out on a floured board, roll it to ¾in. thick, and cut out the doughnuts. Leave them to


DOUGHNUTS BEING SET TO DRAIN ON PAPER

RECIPES FOR DEEP-FAT FRYING



THE PREPARATION OF POTATO CHIPS

rise again for 20 to 30 minutes, then fry them in deep fat at 365 degrees for 2 to 3 minutes, putting them into the fat raised side down. Take them out, drain them, and sprinkle them with rolled icing sugar. The ingredients given make about 2 dozen doughnuts.

Doughnuts (English style)

2 eggs
4 tablespoons of melted fat
5oz. of sugar
¼ teaspoon of salt
½ pint of milk
¾ teaspoon of cinnamon
1 teaspoon of baking powder
Flour to form a soft dough

Beat the eggs and sugar until they are light and creamy. Add the butter, salt, cinnamon, and milk. Sift in the flour and baking powder until a soft dough is formed. Knead it gently and roll it out on a floured board to 1in. thick. Cut the dough into circles and fry them until they double in size and are golden brown.

Potato Fritters (Sweet)

3 large potatoes
¾ cup of powdered sugar
Lemon or orange flavouring
¾ cup of flour

Cook and mash the potatoes and add the sugar and flavouring. Allow the potato to cool, then add the flour, and knead the dough until it is very firm. Roll it out to ¾in. thick, cut it with a biscuit cutter, and fry the fritters in deep fat at 360 to 370 degrees until they are brown and crisp, turning them once. Drain them before serving them.

Savoury Potato Cakes

1 egg
2 tablespoons of butter or fat
2 tablespoons of chopped mint
½ teaspoon of salt
2 cups of hot mashed potatoes
Sifted breadcrumbs
Pepper

Add the egg yolk, butter, seasonings, and mint to the potatoes. Shape the mixture into cakes and dip them into the slightly-beaten egg white, which has been diluted with 2 tablespoons of water. Roll the cakes in breadcrumbs and fry them at 375 to 390 degrees until they are brown.

Potato Chips

French fried potatoes: Peel the potatoes, cut them in ½in. slices lengthwise, then again to form chips about ½in. square and 2 to 3in. long. Dry them carefully with paper or cloth; if water is left on the chips, the fat will splutter when they are put in. Fry them at 395 degrees until they are crisp outside and floury inside. Drain them on paper and sprinkle them liberally with salt before serving them.

Saratoga chips or potato crisps: Peel the potatoes and cut them into very thin slices. Soak the slices for an hour in cold water, then dry them carefully. Fry the chips in deep fat at 395 degrees a few slices at a time until they are crisp and brown. Drain them on paper and sprinkle them with salt. These chips are served as a garnish or decoration or as something to nibble at parties rather than as a way of including potato in a meal. They may be kept for several days in an airtight tin and, if necessary, heated in the oven to crisp them before they are served.

Croquettes

Croquettes are made by combining cooked food—usually meat, fish, or vegetables—or cheese with a thick white sauce, in the proportion of 2 cups of food to one of sauce, and shaping the mixture into balls, cylinders, or cones, which are dipped in egg and breadcrumbs and fried in deep fat. This is a good way of using left-over food.

Pea and Carrot Croquettes

1 cup of cooked carrots, mashed
1 teaspoon of chopped parsley
1 cup of thick white sauce
1 cup of cooked peas
1 tablespoon of melted butter
Salt and pepper
1 egg
Dry breadcrumbs

Combine the carrots, peas, parsley, white sauce, and butter. Season the mixture, cool it, and shape it into croquettes. Roll them in breadcrumbs, then in slightly-beaten egg, then in crumbs again. Fry them at 380 degrees for 3 to 5 minutes. Drain and serve them.

Egg Croquettes

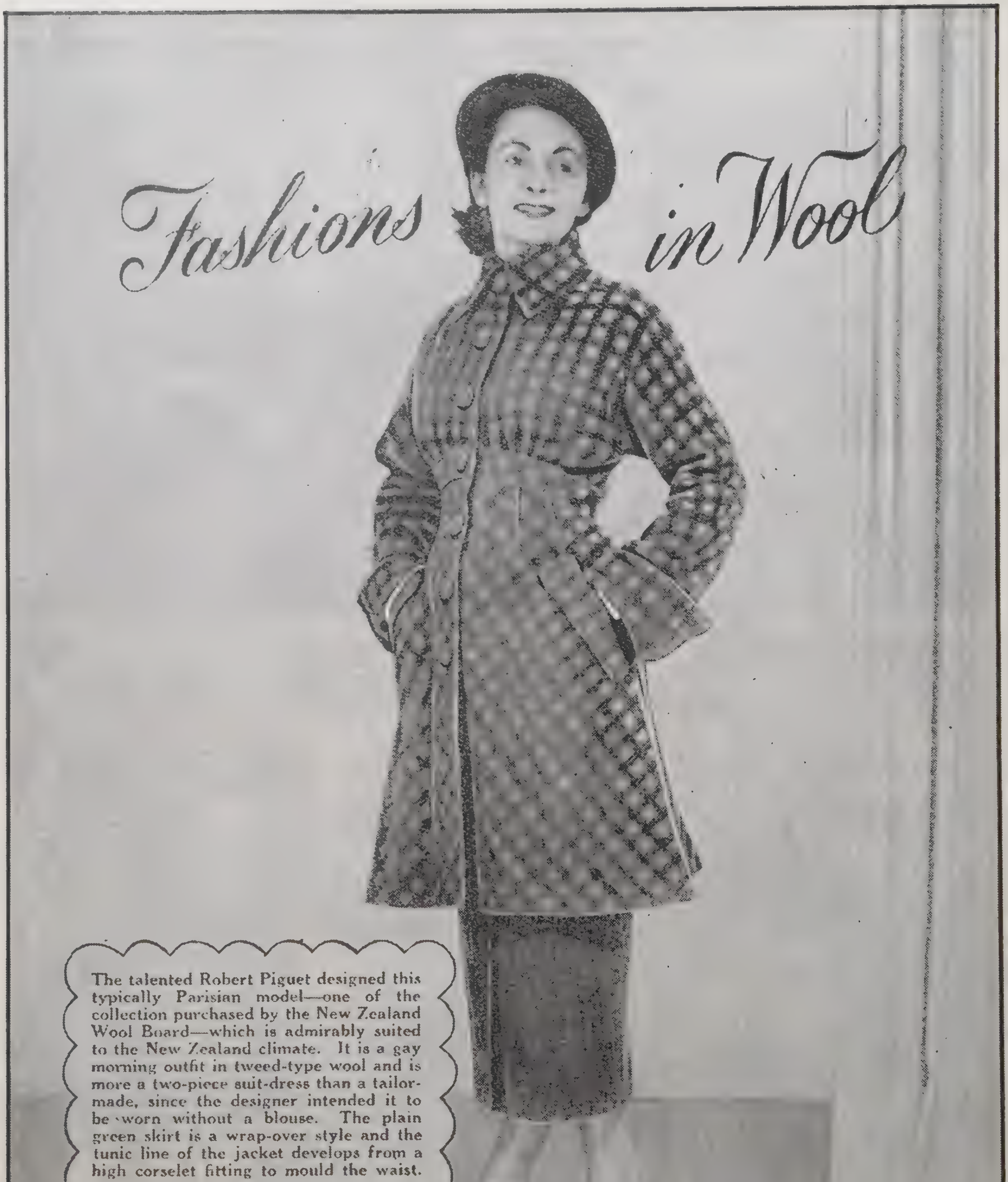
2 cups of chopped hard-boiled eggs (4 or 5 eggs)
1 cup of thick white sauce
½ teaspoon of salt
Pepper
1 beaten egg
Dry breadcrumbs

Chop the eggs finely and moisten them with sauce until the mixture is as soft as can be handled. Season it and cool it well. Shape the croquettes and roll them in crumbs, then in egg, then in crumbs again. Fry them at 380 degrees for 3 to 5 minutes. Drain and serve them.

Meat or Fish Croquettes

Minced cooked meat or finely-flaked cooked fish should be mixed with the sauce in the proportion of 1¾ to 2 cups of meat or fish to 1 cup of sauce. Appropriate seasonings such as tomato sauce, chopped parsley, lemon juice, worcester sauce, or a little pre-cooked onion may be added.

Fashions in Wool



The talented Robert Piguet designed this typically Parisian model—one of the collection purchased by the New Zealand Wool Board—which is admirably suited to the New Zealand climate. It is a gay morning outfit in tweed-type wool and is more a two-piece suit-dress than a tailor-made, since the designer intended it to be worn without a blouse. The plain green skirt is a wrap-over style and the tunic line of the jacket develops from a high corselet fitting to mould the waist.

Photo News Ltd. photo.

Most Roses may be Pruned during August

OPINIONS differ about when rose bushes should be pruned. In districts of New Zealand where late frosts are to be expected delay until mid-September is frequently advocated, the reason put forward being that early pruning induces early growth which, because of its tenderness, is likely to be cut back or badly injured by the sharp frosts to be expected during September and October. It is also argued that by delaying the time of pruning for a few weeks not only the growth but the time of flowering is delayed for a corresponding period, thus assuring that the blooms will open at the season of the year when the weather is more settled and more favourable for good flowering. The gardener must be guided by the conditions that prevail in his district, but as a general rule roses may be pruned to advantage during August. The reasons for and methods of pruning are explained in this month's article for the flower gardener by M. J. Barnett, Director of Reserves to the Christchurch City Council.

[Green and Hahn Ltd. photo.

The golden-berried holly *(Ilex aquifolium fructu luteo)*. Most of the evergreen hollies, in addition to being among the best of ornamental shrubs, are especially attractive when covered with berries, which remain throughout the winter and even into summer. The golden-berried variety is one of the best. All the hollies thrive in a deep, rich soil.

WHAT is of greater importance than knowledge of when to prune is knowing why and how the pruning should be carried out. The reasons for the annual pruning of roses may be given as follows:

To produce a number of good, healthy, clean, and well-developed blooms of fair size and substance. It is important to bear in mind that the flowers are borne not on spurs or on the previous year's wood, but on the current year's wood—that is, on the young growths that develop from the main stems during spring and early summer. (The second crop of flowers which will develop later will be referred to in a subsequent article.) To induce the production of these strong lateral growths the main stems must be cut back sufficiently to eliminate the weaker growth buds toward the extremity of the stems.

To maintain the bushes healthy, vigorous, and free from disease. Toward this end all dead, decayed, weak, and injured stems or growth should be removed. Moreover, whenever possible as much of the old spent wood should be cut out to make room for the younger and healthier growths that arise from the bases of the bushes. Rose scale is more likely to attack the older wood than the younger and more vigorous growths. The latter growths must not be confused with the soft, sappy ones that develop late in the season, which are of little value and are better removed.

To improve the general shapeliness and habit of the bushes. A few of the leading growths may be considerably longer than the remainder, and in such circumstances it is necessary to restrict the taller ones to a height in conformity with the general habit of the bush.

Above all, to keep the bushes open so that air and light can penetrate freely to every part of them and the leaf and stem tissues become hardened and more resistant to disease. The overcrowding of growths and foliage is not hygienic; it provides a harbourage for pests and diseases, and when sprays for their control have to be used the spray particles are prevented from reaching all the foliage and stems.

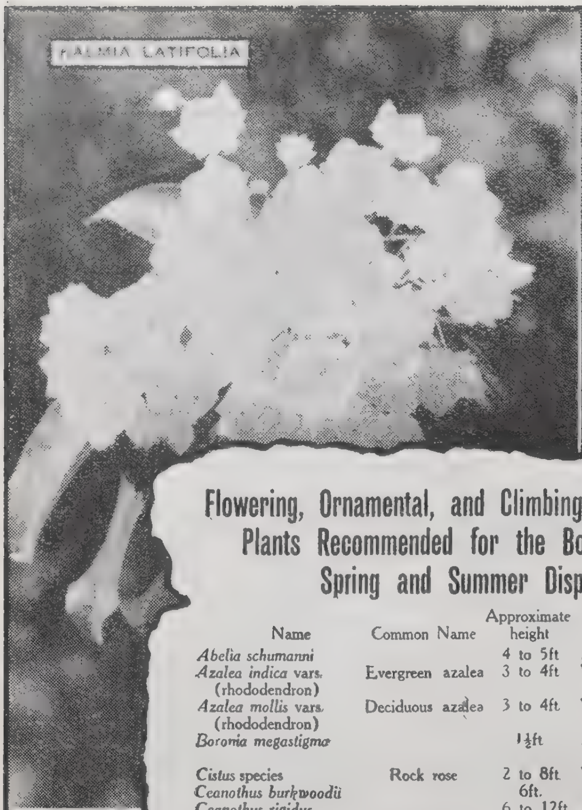
Pruning Technique

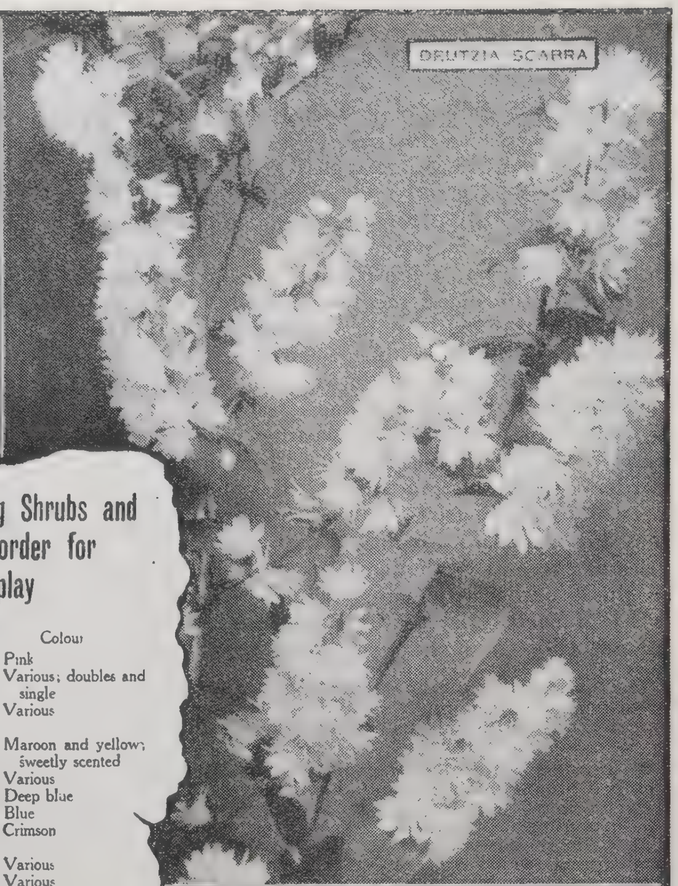
The beginner too frequently approaches the work of pruning with some diffidence and no little temerity, being afraid to cut away too much, and thus damage the plants. If the following procedure is adopted, the gardener cannot go far wrong:

First, procure the necessary tools, which consist of the best pair of secateurs that money can buy, a strong, sharp knife, a pruning saw, and a tough pair of pruning gloves. The secateurs are for the general pruning, but should never be used for cutting wood that is too thick for them; many a good pair of secateurs has been spoilt by attempting to cut through growths that are beyond its capacity to deal with. The knife is to cut away portions that cannot be reached with the secateurs and to trim off any ragged cuts made with the saw or secateurs. The saw is for removing all thick and old wood. The gloves, of course, are to protect the hands and wrists from the thorns.

Begin the operation by removing all dead and decayed wood and all the soft, immature growths. Next, cut away weak and straggling shoots and all those that tend to grow inward and spoil the habit or shape of the bush. Then study the bush, compare the old wood with the newer growths, and decide how much of the old growth can be sacrificed to make way for the new. All that remains is to shorten back stems and strong lateral branches that are left. One of the old rules for pruning is "Hard pruning for weak growers and light pruning for strong growers," which means that weakly-growing bushes should be pruned hard back to induce them to make stronger growths, whereas bushes that make strong growth should be pruned more lightly.

Growers who desire a limited number of perfect blooms for exhibition prune much more heavily than would the gardener whose aim is a good show of flowers of average quality. A professional demonstration of how roses should be pruned frequently draws such remarks as "But that is simply slaughter; what I want is plenty of blooms and not flowers that will excel on the show bench." There is no reason why judicious pruning should not only produce numbers of blooms, but ones of good quality too. A well-formed bloom of good average size is worth three or four small, badly-developed ones. If the remaining stems are left intact or only tipped, weak buds near the top tend



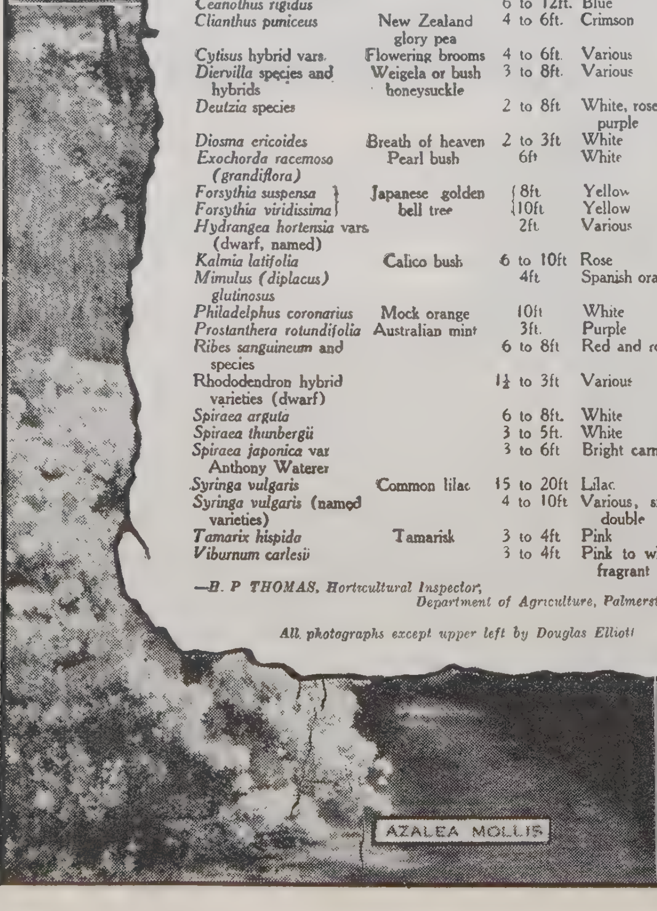


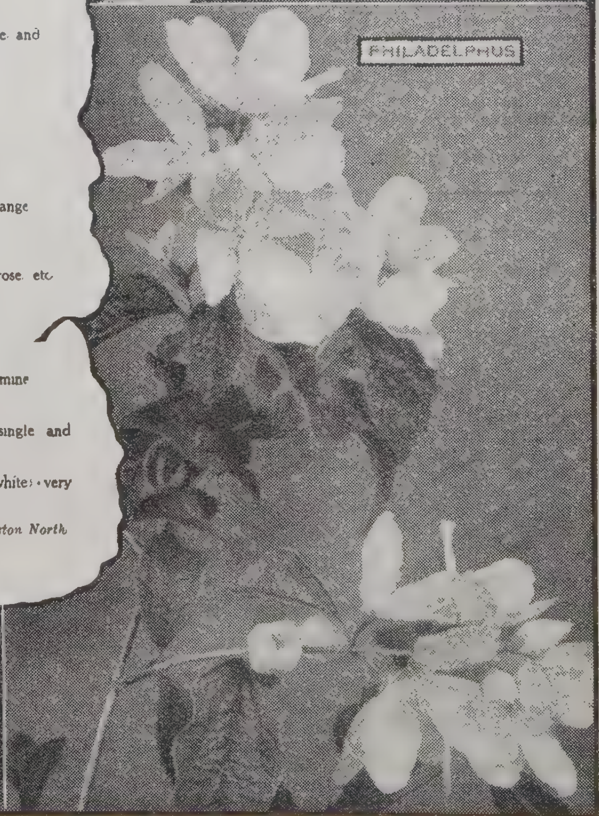
Flowering, Ornamental, and Climbing Shrubs and Plants Recommended for the Border for Spring and Summer Display

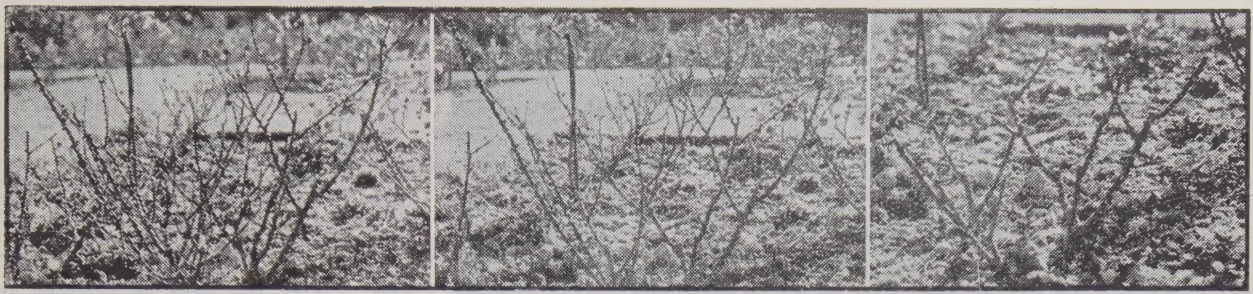
Name	Common Name	Approximate height	Colour
Abelia schumanni		4 to 5ft	Pink
Azalea indica vars. (rhododendron)	Evergreen azalea	3 to 4ft	Various; doubles and single
Azalea mollis vars. (rhododendron)	Deciduous azalea	3 to 4ft	Various
Boronia megastigma		1½ft	Maroon and yellow; sweetly scented
Cistus species	Rock rose	2 to 8ft	Various
Ceanothus burkwoodii		6ft.	Deep blue
Ceanothus rigidus		6 to 12ft.	Blue
Clianthus puniceus	New Zealand glory pea	4 to 6ft.	Crimson
Cytisus hybrid vars.	Flowering brooms	4 to 6ft.	Various
Diervilla species and hybrids	Weigela or bush honeysuckle	3 to 8ft.	Various
Deutzia species		2 to 8ft	White, rose and purple
Diosma ericoides	Breath of heaven	2 to 3ft	White
Exochorda racemoso (grandiflora)	Pearl bush	6ft	White
Forsythia suspensa	Japanese golden bell tree	8ft	Yellow
Forsythia viridissima		10ft	Yellow
Hydrangea hortensia vars. (dwarf, named)		2ft	Various
Kalmia latifolia	Calico bush	6 to 10ft	Rose
Mimulus (diplacus) glutinosus		4ft	Spanish orange
Philadelphus coronarius	Mock orange	10ft	White
Prostanthera rotundifolia	Australian mint	3ft.	Purple
Ribes sanguineum and species		6 to 8ft	Red and rose, etc.
Rhododendron hybrid varieties (dwarf)		1½ to 3ft	Various
Spiraea arguta		6 to 8ft.	White
Spiraea thunbergii		3 to 5ft.	White
Spiraea japonica var. Anthony Waterer		3 to 6ft	Bright carmine
Syringa vulgaris	Common lilac	15 to 20ft	Lilac
Syringa vulgaris (named varieties)		4 to 10ft	Various, single and double
Tamarix hispida	Tamarisk	3 to 4ft	Pink
Viburnum carlesii		3 to 4ft	Pink to white; very fragrant

—*B. P. THOMAS, Horticultural Inspector,*
Department of Agriculture, Palmerston North

All photographs except upper left by Douglas Elliott







[Green and Hahn Ltd. photos.

Left—A rose bush ready for pruning. Middle—With all weak, old, and surplus growth removed, leaving only the stronger shoots which are to be shortened back. Right—After the final pruning.

to break into growth at the expense of the stronger dormant buds below. Therefore the general rule is to prune back to a strong outward-growing bud about midway along the stem. The cut should not be made too close to the bud, but between ¼ and ½in. above it.

Individual Treatment

Those are but the general rules for pruning. Different types and varieties of roses require individual treatment. The gardener should study his bushes not only at the time of pruning but during their subsequent growth, carefully noting the effect of his efforts and the results that have been attained. Single-flowered roses require only sufficient pruning to keep the bushes vigorous and shapely. A standard rose, being budded on to an upright stock, cannot renew the old wood by fresh growths from the base and therefore requires much harder pruning to keep it well balanced than does a bush plant. Young bushes planted out in autumn should be cut back to within two or three buds of the ground so that they will produce from these good strong shoots to serve as a foundation for the future.

Young plants received from a nurseryman are seldom pruned as hard back as they should be. That is not done with any intention to deceive, but rather to ensure that the buyer is given a fair deal. During the handling the plants receive during lifting, packing, marketing, and planting they may receive some injury, and if more growth is left on than is necessary, it acts in some measure as a protection for the vital dormant buds lower down the stems.

Disposal of Prunings

Immediately pruning has been completed all the spent leaves and prunings should be collected and burnt. The winter form or resting spores of such diseases as mildew, rust, and black spot find a lodging in such leaves and branches, and collecting and destroying prunings is a step toward preventing the spread of the diseases the following year.

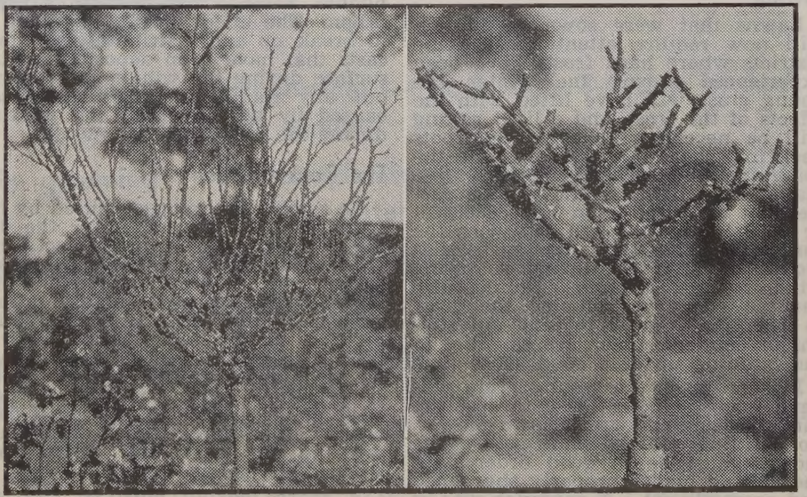
With the beds and borders clear of debris, the next operation is to spray the bushes thoroughly. If any sign of rose scale is apparent, the bushes should be sprayed with an approved winter oil. As a precaution against mildew lime sulphur should be used to destroy the winter spores, which have a habit of lodging in the tiny cracks in the bark, at the base of the thorns, and even in the scales surrounding the growth buds.

Transplanting and Replanting

August is a busy month in the garden. All constructional work and alterations planned should be completed as soon as possible to have the garden in good order for the spring and summer.

If not already attended to, the herbaceous borders should be given a complete overhaul and any transplanting that is necessary done immediately. Strong, robustly-growing plants such as many of the michaelmas daisies, *Monarda didyma, Rudbeckia newmanii, Doronicum plantagineum,* and the large ox-eye daisies during one season make such mats of growth at the bases that the crowns become overcrowded, to the detriment of the plants. In such circumstances the centres of the crowns not infrequently decay, while the more vigorous portions grow outward and sometimes encroach on the proper confines of adjacent subjects. In such cases the plants should be lifted intact and the younger and more vigorous portions separated carefully from the crowns and replanted in fresh soil. However, if it is impracticable to give them a new position in the flower border, the old site should be dug over and manured before they are replanted. The old or unwanted portions of the crowns or stools can be disposed of in the compost heap.

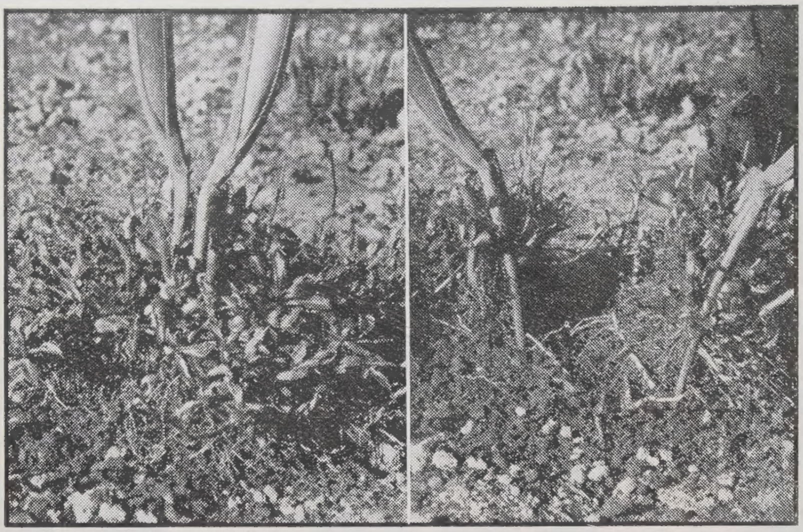
The youngest and most vigorous pieces should always be selected for replanting. The use of a spade for cutting the clumps into conveniently-sized pieces cannot be recommended. It is a drastic practice which frequently results in much harm to the plants and in subsequent disappointment with the results. The roots of the younger and older portions are intermingled, and when a spade or knife is used to separate the pieces the roots of both are severed roots sets up a decay that may wanted portion is deprived of much of its root system and the mass of severed roots sets up a decay that may prove fatal to the remainder. In some cases the crowns may be separated easily with the fingers, but where that is difficult it is better to use two small garden forks, which are driven into the crown back to back; by the pressing or levering of the handles outward, the crown is forced apart without undue injury to the roots.



[Green and Hahn Ltd. photos.

A standard rose ready for pruning and after being pruned.

WORK IN THE FLOWER GARDEN



[*Green and Hahn Ltd. photos.*

Left—A crown of michaelmas daisy (perennial aster) lifted for division after one season's growth. Right—The forks levered apart, dividing the crown in halves. The pieces can be further divided with the hands into pieces of convenient size for planting.

Holes to accommodate the plants should be sufficiently wide and deep to allow the roots to be spread out without their being forced into too confined a space. The soil should be sufficiently firm about the roots that when the work is completed the plants cannot be removed when given a slight upward tug with the hand.

Care of Lawns

Though autumn sowing of grass seed for lawns is preferable to spring sowing, sometimes through force of circumstances the latter time must be reverted to. Provided the soil is in a fit condition and not too wet and sticky, August is favourable for such sowing.

Lawns that were sown in autumn will now require attention. In some districts where hard frosts have been experienced during the winter the young grass will have lifted with the effects of the frost, and a light rolling will be necessary to press the roots back into the soil and consolidate the soil round them. Rolling, however, no matter how light, should not be carried out when the lawn surface is wet or the soil sticky. A fine day when the surface is reasonably dry, such as it would be after or during a drying wind, is most suitable. Rolling also has the effect of inducing the grass to tiller out—that is, to send out stolons or runners, which are essential in the building up of a good, close turf.

In some cases the young grass will have made sufficient growth to warrant its being cut with a lawn mower. For cutting closely and evenly the mower must be in good order with the cutting blades properly sharpened and correctly set. A gardener who is not sure how a machine should be sharpened and set should seek the advice and services of an expert. It is especially important for new lawns that the knives cut the grass cleanly and not merely chew through it.

Some people advocate leaving grass mowings on a lawn, contending that as they decay they assist in feeding the living grass plants. No doubt they do, but at this season grass clippings tend to be lush and heavy with moisture and remain as "clots" on the lawn, where they not only look unsightly, but quickly start a decay which is likely to affect the young, tender grass below. For early mowing a day similar to that recommended for rolling should be chosen.

It is also a good practice before mowing and rolling are carried out to switch or sweep the lawn with a long, pliable, bamboo rod or with a birch broom. The effect of this sweeping is to break up and distribute any worm casts that have been deposited on the surface during the winter and to even out any minute inequalities of soil caused by the action of the weather during the preceding few months.

The Rock Garden

To rectify the ravages caused by the winter and to prepare it for the display of spring-flowering subjects that will be starting from now on, the rock garden will require immediate attention. Subjects planted last autumn may have been lifted slightly by the action of frost or the soil washed away a little by heavy rains. The plants should be examined carefully and, if necessary, pressed gently back into the soil. Dead foliage should be removed from around the plants and a light top-dressing of loam and sharp sand worked in among them.

A sharp lookout must be kept for slugs which have found the rock garden an admirable winter resting place and now emerge from their hiding places with the warmer weather to feast on the tender buds of some of the choicest alpines.

Weeds in Paths

Now is the time to trim the edges of lawns and clean all pathways. One of the worst weeds in pathways at this time of the year is the annual meadow grass *Poa annua.* This grass, though only an annual, can be a real pest. With the advent of wetter weather in autumn the seeds germinate readily, continue to grow throughout winter, and develop into strong growth in spring. Within days it begins to flower and soon the seed is set. With the heat of summer the plants die, but thousands of seeds are left behind in the gravel and screenings of the path ready to produce a second crop of weeds as soon as conditions are favourable for their germination. Such weeds should be eradicated before they have had time to produce and set their seeds.

Plants to Propagate

Late-flowering chrysanthemums that flowered under glass during May and June and which were cut over and placed outside will now be sending up fresh growths from the bases, and no opportunity should be lost of taking and striking cuttings from them. The sturdiest shoots which develop a few inches away from the base of the old stem should be selected when they are a few inches above the surface. The cuttings, which require little preparation, should be inserted in a sandy compost in boxes or pots and placed in a cool but close frame, where they will take root in a fortnight or so, when the receptacles can be removed to more light and a more buoyant atmosphere.

Some growers prefer to strike the cuttings singly in 3in. pots. The pots are plunged in sawdust in a cool frame in the greenhouse, and as each plant takes root the pot containing it is removed. When well rooted the plants can be removed for potting on more readily and with less damage to the roots than is the case where several plants are rooted in one receptacle.

Dahlia tubers required to produce cuttings for propagation should be lifted, placed in boxes or trays of light compost, and taken indoors, where they will quickly respond to a higher temperature by producing shoots from the eyes round the junction of the stem with the tuber.

Seeds of antirrhinums, lobelia, fibrous-rooted begonias, petunias, jacobaeas, verbenas, phlox, and dianthus may be sown under glass.

Outdoors in reasonably-warm soil sweet peas and such hardy annuals as larkspurs, clarkias, godetias, nigella, and cornflower may be sown.

Greenhouse plants such as the maidenhair ferns (*Adiantum*) should be potted on and old plants divided up. Where heat is available a few corms of gloxinias for early flowering should be started into growth.

The planting of trees, shrubs, and hedge plants should be continued at every opportunity.

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